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The journal is intended for teachers, coaches, athletes, postgraduates, doctoral students research workers and other industry experts.

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2. Improving the training of athletes of different qualification.
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CONTENT

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DIFFERENTIATION OF THE CONTENT OF PHYSICAL EDUCATION LESSONS TAKING INTO ACCOUNT INDICATORS OF THE STATE OF THE CARDIORESPIRATORY SYSTEM OF PUPILS IN THE SECONDARY SCHOOL

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Purpose: to study the dynamics of the cardiorespiratory system indicators of 13 - 14-year-old pupils under the influence of the differentiated content of physical education lessons.

Material and methods: 103 pupils of the comprehensive school No. 150 of Kharkov took part in the research. The methods were used in the research: theoretical analysis and synthesis of scientific-methodological literature; biomedical methods (tonometry, pulsometry, and spirometry); pedagogical experiment; methods of mathematical statistics.

Results: the level of functioning of the cardiorespiratory system in 13 - 14-year-old pupils is below average. Taking into account the indicators of the functional state of the cardiovascular and respiratory systems of 13 - 14-year-old pupils, the content of physical education lessons is differentiated; the development and implementation of physical exercise complexes aimed at increasing the above indicators.

Conclusions: as a result of the introduction of the developed physical exercise complexes in indicators characterizing the state of cardiovascular and respiratory

systems of pupils of experimental groups, there were reliable positive changes in all the studied parameters ($p<0,05$ - 0,001). As a result, the state of the cardiorespiratory system of 13-14-year-old pupils increased from below average to average.

Keywords: physical health, cardiovascular system, respiratory system, physical education, 13 - 14-year-old pupils.

Introduction

Today a serious problem is the preservation of the health of the younger generation. This issue is particularly acute for the modern school, as researches indicate that their physical health levels are deteriorating significantly during the school years [10, 19, 24]. The intensity of the educational process and the growth of mental burden; indifferent and sometimes negative attitudes towards physical culture; a sedentary lifestyle is a determining factor in the deterioration of the physical health of school-age children [16, 17, 21, 26].

Physical education is the main factor in the formation of a healthy personality. It was proved that adequate physical activity, rationally constructed motor activity contributes to improving the functional potential of the main systems of the body, mental and physical performance; is an effective factor in creating positive emotions, contributing to the child's health [1, 18, 25, 27].

However, leading experts point to the insufficient effectiveness of the physical education system in educational institutions and attribute this to the fact that mainly meaningful content of classes remains typical [20]; lesson forms are based on standard normative approach [12]; many schools don't carry out extracurricular physical education work [6]; only a small number of teachers implement innovative technologies [11], etc. Therefore, the system of physical education requires qualitative changes.

The analysis of scientific literature revealed that one of the current directions of optimization of the physical education process of children of different ages and sexes is a differentiated approach, providing for taking into account the individual typological characteristics of each child [2, 4, 8]. To solve this problem successfully,

researchers propose taking into account indicators of physical development [2], physical health [23], motor fitness [20], etc.

However, it should be noted that the issue of expanding the functional potential of the main systems of the body of pupils of the secondary school by differentiating the content of physical culture lessons remains unexplored.

The purpose of the research is to study the dynamics of the cardiorespiratory system indicators of 13 - 14-year-old pupils under the influence of the differentiated content of physical education lessons.

Material and Methods of research

The research was carried out based on of secondary school No. 150 in Kharkiv. It was attended by 103 pupils, of which 2 experimental and 2 control groups were formed. So, the first experimental group included 13-year-old pupils (18 boys and 33 girls), the second - 14-year-old pupils (29 boys and 23 girls). Control groups were formed accordingly: the first - 10 boys and 17 girls, the second - 16 boys and 12 girls. The pupils participating in the research were almost healthy. Consents were obtained from parents to participate in the research.

The quantitative evaluation of the functioning of the cardiorespiratory system of the research contingent was carried out according to Robinson index, which characterizes the state of the cardiovascular system; Ruffier index - characterizes the response of the cardiovascular system to standard physical activity; Skibinski Index - characterizes the functionality of the respiratory system and the body's resistance to hypoxia. To calculate these indices, the following were determined: blood pressure (BP), heart rate (HR) at rest and after physical exertion (30 squats in 45 s), vital capacity of lungs (VCL), breath retention time (Stange test). The obtained average indicators were compared with the evaluation scale proposed by S. D. Polyakov and co-authors [14].

According to the results obtained, the content of physical culture lessons was corrected taking into account the individual capabilities of pupils.

So, the content component of the curriculum is white divided into two sections: *basic and variable*. *The main section* contained the educational material of the basic

modules: athletics, basketball, volleyball and football. We differentiated the content of the *variable section* taking into account the identified individual capabilities of pupils. Thus, complexes of physical exercises aimed at improving the functional state of the cardiovascular and respiratory systems were developed for each formed typological subgroup. The physical exercise complexes included the basic movements of CrossFit cardio training – "BURPEE" (transition from a standing position to a lying position); "WALKING LUNGES" (lunge-walk); jumping up, jumping through a racecar (single, double, and triple); aerobic exercises (fast and dosed walking, fast running); breathing exercises with an emphasis on deep breathing and forced exhalation, with holding breathing and exercises of breathing gymnastics A. M. Strelnikova [15] – "Palms", "Square one's shoulders", "Head turns", "Ears", etc. These exercises were performed by pupils of experimental groups in the main part of the lesson, after mastering the technical and tactical actions of the planned modules. The number of repetitions and intensity of exercise was gradually changed. Exercises were carried out in the aerobic mode, the intensity wasn't exceeded 60 ‑ 70 %, by heart rate ‑ 170 ‑ 180 bpm^{-1}, breath frequency ‑ 16 ‑ 20 cycles per min^{-1}. The developed physical exercises were introduced into the content of independent classes, organized individual classes, and offered as differentiated homework. The permission to change the program was received from the school administration.

Pupils of control groups, during the school year, were engaged in the educational program for general educational institutions "Physical culture for the 5^{th}-9^{th} grades" [13]. Athletics, volleyball, basketball, and football lessons were held; the structure of the lessons and the pedagogical aspects of the organization of the educational process was typical.

During the research, the following methods were applied: theoretical analysis and synthesis of scientific and methodological literature; biomedical methods (tonometry, pulsometry, spirometry); pedagogical experiment (ascertaining, molding); methods of mathematical statistics.

Mathematical and statistical processing of the actual material was carried out to interpret the results of the pedagogical experiment using the computer program

STATISTICA 10.0. The arithmetic mean ($\overline{X}$) was determined to characterize the population according to individual parameters; error of mean value (m) - for determination of deviation of arithmetic mean from corresponding parameters of the general population; reliability of differences (p) - was determined to establish the degree of changes in the average values of the analyzed parameters after the experiment. The validity of the differences was determined according to the probability of Student's distribution (t) at a level of at least $p<0,05$.

Results of the research

The results of the constant experiment show that there are no statistically significant differences between the control and experimental groups for all the indices studied ($p>0,05$). As a result of a comprehensive study of the state of the cardiorespiratory system according to the indicators of Robinson, Skibinski, Ruffier indexes, it is determined below the average level of functioning of the cardiorespiratory system in 13 - 14-year-old pupils of both study groups (Fig. 1).

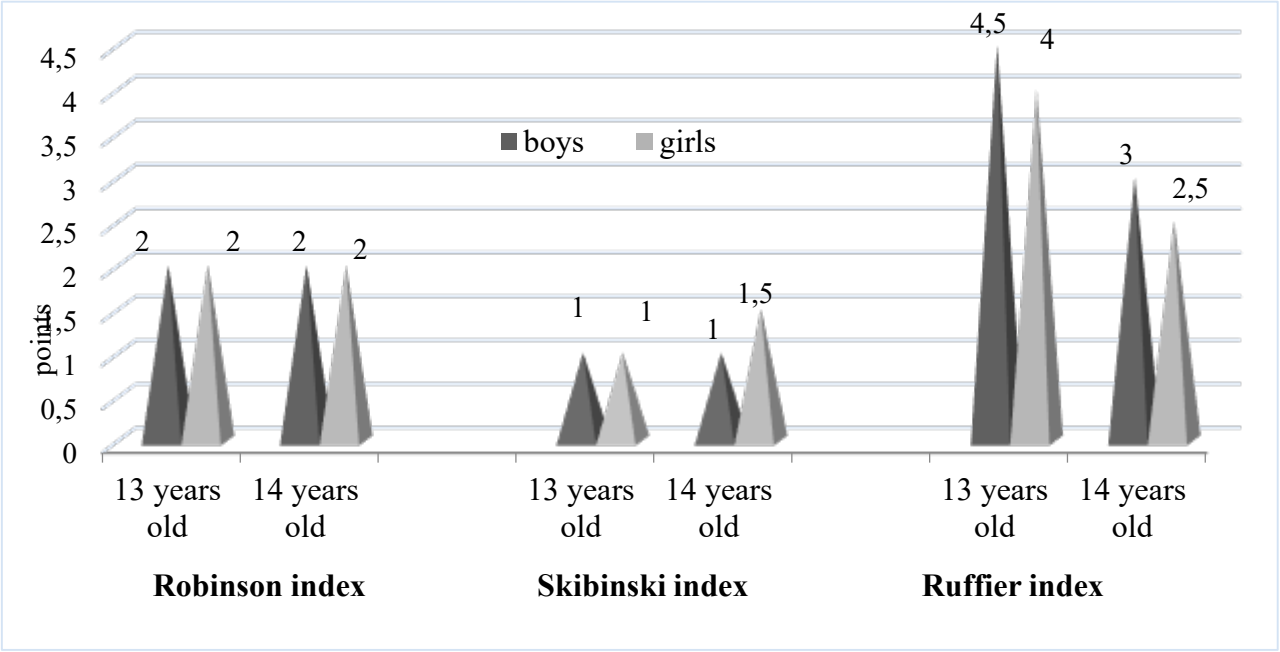

Fig. 1. The assessment of the functional state of the cardiorespiratory system of 13 - 14-year-old pupils before the experiment

The analysis of the repeated data characterizing the state of cardiovascular regulation (Robinson index) obtained after the experiment (Table 1-2) determined a reliable decrease in AP and HR indicators both in boys and girls of experimental

groups (p<0,001). Significant changes weren't observed in the control group pupils after the experiment (p>0,05).

The comparison of the repeated data of the Robinson index with the assessment scale [14] indicates that as a result of the introduction of the developed physical exercise complexes taking into account typological features, in 13 - 14-year-old pupils of experimental groups, the level of regulation of the cardiovascular system below the average (2 points) increased to the average (3 points). Significant changes weren't detected on the assessment scale pupils of the control group, as a result of which the level of regulation of the cardiovascular system didn't change (below average).

Table 1

Cardiorespiratory system of functional status indicators of boys of experimental groups before and after the experiment

Indicators		Before the experiment	After the experiment	t	p
		$\overline{X} \pm m$			
13 years old (n=18)					
ЧСС (bpm^{-1})		83,11±2,99	75,17±0,95	3,87	<0,01
AP syst' (mmHg)		113,28±2,24	103,33±1,93	9,91	<0,001
$AP_{diast'}$ (mmHg)		73,83±1,76	68,06±1,35	5,77	<0,001
HR for 15 s (number of times)	P_1	16,00±0,61	16,33±0,54	1,52	>0,05
	P_2	27,89±1,12	29,94±0,57	3,08	<0,05
	P_3	17,89±0,72	18,28±0,51	1,18	>0,05
VCL (ml)		2016,67±65,11	2472,22±65,40	19,09	<0,001
Breath retention time (s)		30,33±1,00	44,17±1,23	10,81	<0,001
14 years old (n=29)					
ЧСС (bpm^{-1})		88,00±3,10	76,14±1,06	5,08	<0,001
AP syst' (mmHg)		120,38±2,16	102,34±1,24	11,98	<0,001
$AP_{diast'}$ (mmHg)		77,07±1,71	68,76±0,68	6,59	<0,001
HR for 15 s (number of times)	P_1	20,86±1,13	18,28±0,30	3,21	<0,01
	P_2	31,93±1,16	32,76±0,53	1,59	>0,05
	P_3	25,03±1,27	20,86±0,32	6,34	<0,001
VCL (ml)		2124,14±71,37	2544,83±57,94	16,20	<0,001
Breath retention time (s)		32,41±1,85	41,21±1,70	11,08	<0,001

P_1 – HR for 15 s at rest, P_2 – HR for the first 15 s of the recovery period after load, P_3 – HR for the last 15 s of the first minute of recovery

Examining the repeated data of Skibinski index, characterizing the functional capabilities of the respiratory system, the body's resistance to hypoxic phenomena

(Table 2-3), the increase in VCL and respiratory retention time (Stange sample) in pupils of experimental groups was revealed and these distinctions are reliable ($p<0,01$; 0,001).

Analyzing similar indicators of pupils of control groups obtained after the experiment, insignificant positive changes were established for all the studied parameters ($p>0,05$).

A repeated comparison of Skibinski index indicators with the assessment scale [14] indicates that after the introduction of special physical exercises, the level of functional capabilities of the respiratory system in boys of experimental groups from low (1 point) increased to lower (2 points), in girls from low to average (3 points).

Positive changes in Skibinski index indicators were established, both in boys and girls of control groups on the rating scale didn't significantly affect and their level remained at the starting position (low and lower than the average, respectively).

Table 2

Cardiorespiratory system of functional status indicators of girls of experimental groups before and after the experiment

Indicators		Before the experiment	After the experiment	t	p
		$\overline{X} \pm m$			
13 years old (n=18)					
ЧСС (bpm^{-1})		81,55±2,43	76,15±1,08	4,00	<0,01
AP syst' (mmHg)		115,42±1,96	101,55±1,14	9,97	<0,001
$AP_{diast'}$ (mmHg)		75,42±1,24	66,42±1,10	7,97	<0,001
HR for 15 s (number of times)	P_1	15,36±0,45	16,55±0,49	2,42	<0,05
	P_2	27,15±0,68	30,33±0,68	5,73	<0,001
	P_3	17,79±0,51	18,79±0,57	1,91	>0,05
VCL (ml)		1703,03±63,04	2300,00±61,40	12,65	<0,001
Breath retention time (s)		30,52±0,92	39,97±0,78	13,36	<0,001
14 years old (n=29)					
ЧСС (bpm^{-1})		90,91±3,50	76,48±1,15	5,62	<0,001
AP syst' (mmHg)		122,22±2,03	104,26±1,37	12,83	<0,001
$AP_{diast'}$ (mmHg)		77,70±1,45	68,83±0,73	8,44	<0,001
HR for 15 s (number of times)	P_1	18,09±0,79	17,26±0,32	2,00	>0,05
	P_2	30,78±1,27	32,43±0,54	2,36	<0,05
	P_3	21,61±1,07	19,61±0,32	3,09	<0,01
VCL (ml)		2113,04±75,60	2504,35±61,15	9,28	<0,001
Breath retention time (s)		32,61±2,50	42,83±1,84	10,06	<0,001

P_1 – HR for 15 s at rest, P_2 – HR for the first 15 s of the recovery period after load, P_3 – HR for the last 15 s of the first minute of recovery

The repeated analysis of Ruffier index data characterizing the degree of response of the cardiovascular system to standard physical activity (Table 1-2) indicates that the functional sample indicators of pupils in experimental groups decreased and these changes are mainly statistically reliable ($p<0,05–0,001$). The exception is the indicators of safety at rest (R_1) of 13-year-old boys and 14-year-old girls, the results of HR for the first 15 from the recovery period (R 14 years and for the last 15 from the first minute of recovery (R) of 13 - year-old pupils, for which the results improved, but not significantly ($p>0,05$). Significant changes weren't found in the control group pupils after the experiment ($p>0,05$).

The re-comparison of Ruffier index data with the assessment scale [14] found that after the introduction of the developed exercise, in 14-year-old girls of experimental groups, the level of cardiovascular response to standard physical activity increased from the average (3 points) to the highest for the average (4 points). 13-year-old pupils and 14-year-old boys established positive changes at the assessment level didn't affect.

The comparison of similar data of Ruffier index of pupils of control groups with assessment scale [14] shows that insignificant improvement of indicators at the level of the cardiovascular system response to standard physical exercise wasn't affected largely. The exception is the indicators of 14-year-old girls, for which the level from below the average (2 points) increased to the average (3 points).

Examining the general level of functioning of the cardiorespiratory system of pupils of experimental groups, according to the indicators of Robinson, Skibinski, Ruffier indexes, its increase from the lower average (2 points) to the average (3 points) was established (Fig. 2 - 3).

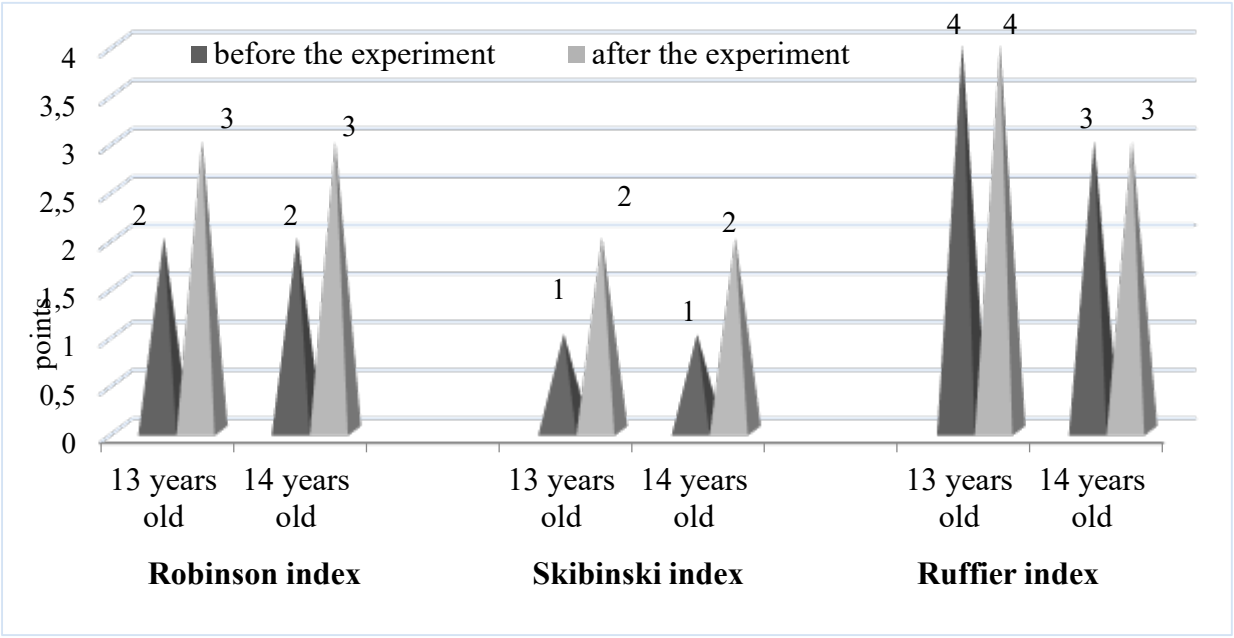

Fig. 2. Assessment of the functional state of the cardiorespiratory system of 13 - 14-year-old boys before and after the experiment

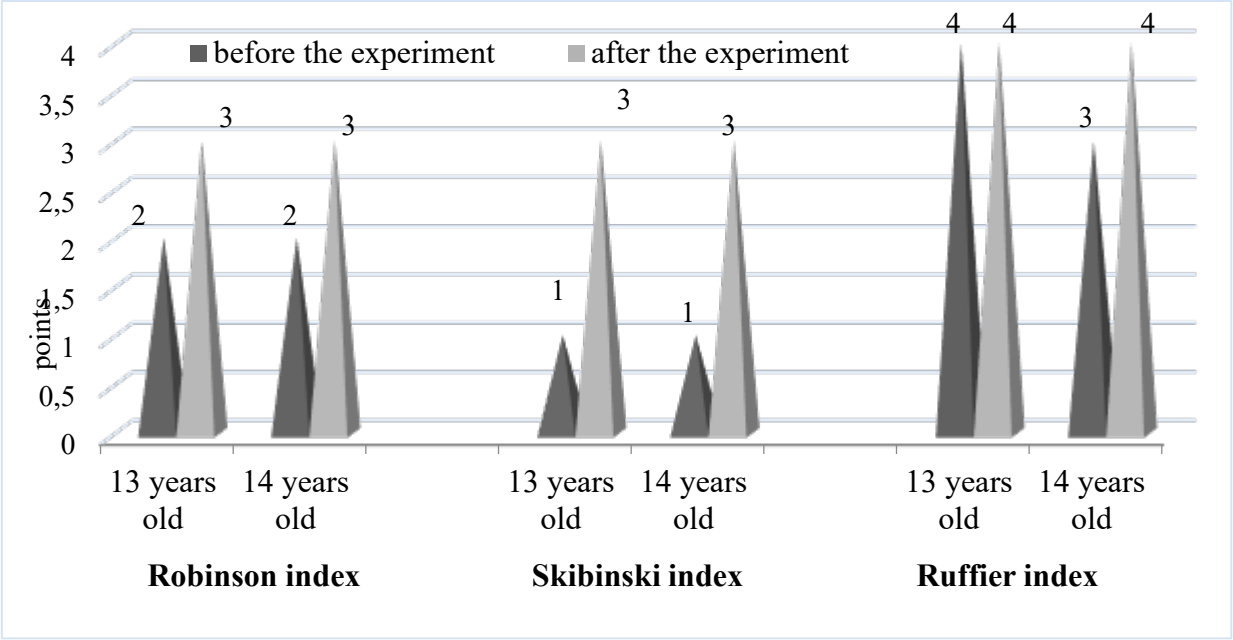

Fig. 3. Assessment of the functional state of the cardiorespiratory system of 13 - 14-year-old girls before and after the experiment

The analysis of similar indicators of pupils of control groups shows that the level of functioning of the cardiorespiratory system, both in boys and girls, remained at the initial position - lower than the average.

Of this, it is worth differentiating the content of physical education lessons taking into account the individual characteristics of pupils, and introducing special physical exercises effectively affects the functional state of the cardiovascular and respiratory systems of 13-14-year old adolescents.

Conclusions / Discussion

The analysis of scientific developments revealed a number of researches on the mainstreaming of the use of a differentiated approach in physical education of school-age children. The research supplemented data on effectiveness: a differentiated approach using information technologies [3]; differentiated standards of physical fitness [4]; a differentiated approach to health status [5]; multilevel system of physical exercise of differentiated training taking into account physical health indicators [7] and level of development of individual motor abilities [9].

To improve the state of the cardiorespiratory system, it is proposed to differentiate the content of physical education lessons, namely, the variable section of the curriculum, taking into account the typological characteristics of middle-school pupils, and to introduce developed complexes of physical exercises aimed at improving the functional state of the cardiovascular and respiratory systems of 13 - 14-year-old pupils.

As a result of the introduction of the developed physical exercise complexes in indicators reflecting the state of the cardiovascular and respiratory systems of pupils of experimental groups, there were reliable positive changes in all the studied parameters ($p<0,05$-$0,001$). As a result, the level of cardiorespiratory systems of 13 - 14-year-old pupils of experimental groups from below average increased to average.

The prospects for further research are to determine the effectiveness of differentiating the content of physical education lessons from another age group.

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MODELING OF INDICATORS OF TECHNICAL AND TACTICAL SKILLS OF HIGHLY QUALIFIED ATHLETES WHO SPECIALIZE IN SWIMMING AT THE DISTANCE OF 200 METERS BY BUTTERFLY STROKE

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Purpose: modeling of technical and tactical skills of highly qualified athletes who specialize in butterfly swimming at a distance of 200 meters.

Material and methods: analysis of literature sources, video recording, timing, methods of mathematical statistics. The contingent of the subjects consisted of athletes who specialize at the distance of 200 meters by butterfly stroke. The level of their sports qualification corresponded to the titles of Master of Sport of Ukraine and international Master of Sports of Ukraine. The total number of the surveyed is 16 swimmers.

Results: have been studied the dynamics of technical and tactical actions of highly qualified athletes during swimming the distance of 200 meters by butterfly stroke, have been determined the relationship between speed, pace, «step» of the cycle of rowing movements and sports result, have been developed the model characteristics of the most important parameters of technical and tactical skills of highly qualified athletes who specialize in butterfly swimming at the distance of 200 meters.

Conclusions: the length of the competitive distance leaves an imprint on the dynamics of technical and tactical skills of highly qualified athletes who specialize in butterfly swimming; the result at the distance of 200 meters by butterfly stroke is

predominantly influenced by the speed parameters on the segments «45 - 50 m», «50 m - emerge», «150 m – emerge» and «185 – 195 m», the pace of rowing movements at intervals «145 – 150 m» and «165 - 175 m», «step» of the cycle of rowing movements on the sections «45 - 50 m» and «185 - 195 m»; determining the compliance of technical and tactical actions of a particular athlete with model characteristics allows to predict areas of correction of the training process in order to achieve the highest sports results.

Keywords: highly skilled swimmers, butterfly, 200 meters, technical and tactical actions, dynamics, correlation, model characteristics.

Introduction

At the present stage of development of swimming one of the ways to improve sports results is a detailed study of competitive activities, both in a broad and in a narrower sense [3; 4].

Effective overcoming the distance is the result of quality overcoming of each of its components, which depends on many factors.

Experts have proved that success at distances of different lengths is largely due to the individual characteristics of athletes, which is manifested in differences in technical and tactical actions, levels of physical qualities and etc. [1, 7, 10, 11, 12; 13, 15, 16].

To date many studies have been conducted, thanks to which identified indicators that affect the effectiveness of competitive activities in different swimming style, identified the degree of relationship between them, characterized the importance of the parameters of competitive activities during swimming distances of different lengths [2, 6, 8, 9].

However, a number of aspects still require more in-depth study.

Thus, questions about the peculiarities of the passage of distances of different lengths in the style of swimming by crawl on the back, breaststroke and butterfly deserves the meticulous attention of experts, because they are insufficiently

considered compared to the freestyle swimming [5, 14].

The problem of modeling the structure of competitive activity and special preparedness of highly qualified athletes of different distance specializations needs attention.

In turn, the focus on the developed model characteristics of athletes who perform at distances of different lengths in different swimming style, allows to determine the priority areas of correction of the training process in order to improve competitive activities.

The purpose of the study – modeling of indicators of technical and tactical skills of highly qualified athletes who specialize in swimming butterfly at the distance of 200 meters.

Objectives of the study:

1. To research the dynamics of technical and tactical actions of highly qualified athletes during overcoming the distance of 200 meters by butterfly.
2. To identify the relationship between parameters of technical and tactical skills of highly qualified swimmers and sports results at the distance of 200 meters by butterfly stroke.

To develop the model characteristics of parameters of technical and tactical skills of athletes who specialize in butterfly swimming at the distance of 200 meters.

Material and Methods of research

The following methods were used to solve the tasks: analysis of literature sources, video recording, timing, methods of mathematical statistics.

Experimental data were collected at the Swimming Championships and Cups of Ukraine in the period from 2018 to 2020. The athletes who specialize on the distance of 200 meters by butterfly stroke the amount of 16 people took part in the study. The level of sports qualification of the surveyed contingent corresponded to the titles of Master of Sports of Ukraine and Master of Sports of Ukraine of Internatonal Class.

Results of the research

Technical and tactical actions of high-class athletes during swimming the distance of 200 meters by butterfly stroke were evaluated by the indicators of speed, pace and «step» of the cycle of rowing movements, which were recorded on the segments: «start – emerge», «emerge - 15 m», distance swimming areas («15 - 25 m», «25 - 35 m», «35 - 45 m», etc.), segments «turn – emerge» (after each turn), finish segment (195 - 200 m) (Fig. 1 – 3).

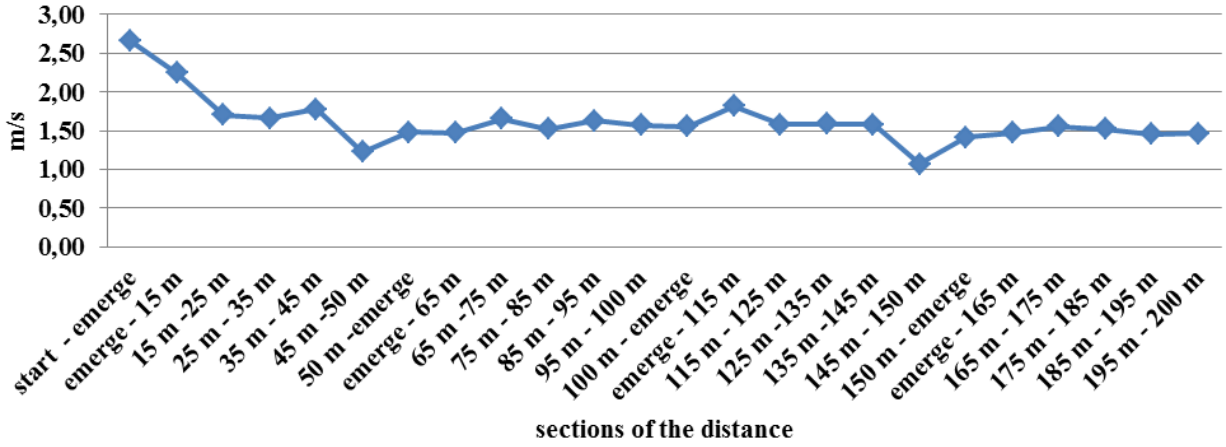

Fig. 1. Dynamics of speed indicators during swimming by high-class athletes the distance of 200 meters by butterfly stroke

As can be seen from Figure 1, the distance of 200 meters by butterfly stroke is generally overcome by athletes at a relatively uniform speed. A significant decrease occurs in the first 25 meters of the distance (from 2,66 to 1,70 m/s), as well as when swimming to the turntable. In the first case, this is due to the loss of speed achieved during the start jump, in the second - with the attempt to effectively perform the turn due to the most rational touch of the pool wall.

The highest rate of speed recorded on the segment «start – emerge» (V=2,66 m/s), the slowest athletes overcome the sections «45 - 50 m» (V=1,23 m/s) and «145 - 150 m» (V=1,07 m/s).

The increase in speed during swimming 200-meters distance occurs after the repulsion from the rotating shield, which is especially noticeable in the area «emerge - 115 m» (V=1,82 m/s).

It is noteworthy that there is no rapid decrease in the distance speed parameters

at the finish meters.

The dynamics of the indicators of the «step» of the cycle of rowing movements on the first two 50-meters segments of the competition distance is relatively similar, , namely, that during overcoming of distances part there is an increase in indicators of length of a rowe with the subsequent their decrease on a segment of swimming to a rotary board (Fig. 2).

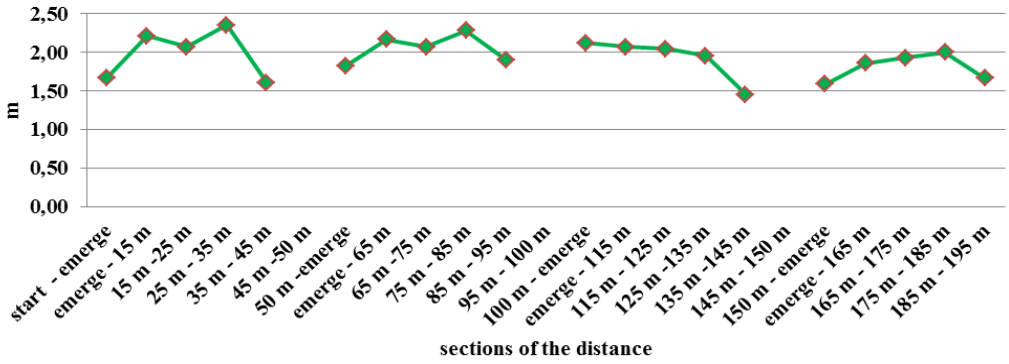

Fig. 2. Dynamics of indicators of «step» of a cycle of rowing movements during swimming by high-class athletes the distance of 200 meters by butterfly stroke

On the third 50-meter section there is a gradual decrease in the parameters of the «step», which due to the transition from anaerobic to aerobic energy supply mechanism.

In the last 50 meters of the distance, the length of the rowing movements increases, except for the segment «195 - 200 m», where observed a reduction of the «step», which is associated with progressive fatigue and the athletes' efforts to effectively do the finish touch.

In turn, each of the four 50-meter segments of the distance is overcome at different tempo modes (Fig. 3).

After a significant decrease of indicators of rowing movements at the beginning of the competition distance (from 78,64 to 46,65 cycles/min) is their relative stabilization.

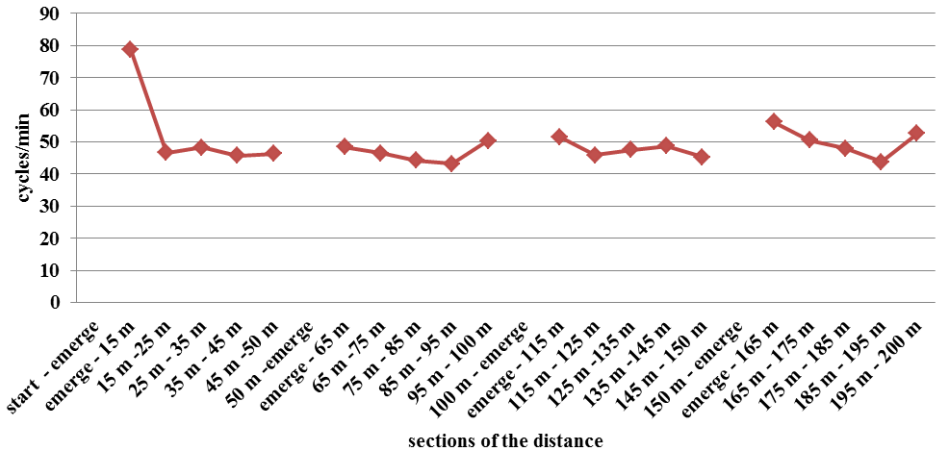

Fig. 3. Dynamics of indicators of pace of rowing movements during swimming by high-class athletes the distance of 200 meters by butterfly stroke

In process of overcoming the second interval of the distance there is a slight but stable decrease in the frequency of rowing (from 48,49 cycles/min to 44,23 cycles/min) with a rapid increase in pace when swimmer approach to the turntable (from 43,20 cycles/min to 50,34 cycle/min).

In the third 50 meters of the distance, the decrease of the frequency of rowing movements changes to increase this indicator with its subsequent decline when sportsmens swims to the turntable. The dynamics of the pace parameters on the fourth and second segments of the distance are generally similar, but in the last 50 meters the change in the values of the absolute frequency of rowing movements is more pronounced.

After studying the degree of influence of the parameters of technical and tactical skills on the result of overcoming by athletes of high class distance of 200 meters by butterfly, it was determined that a close correlation with the final result is observed in the speed indicators on the segments: «45 - 50 m» (r=-0,84), «50 m - emerge» (r=-0,78), «150 m - emerge» (r=-0,85), «185 – 195 m (r=-0,91).

A medium degree is on the segments: «25 - 35 m» (r=-0,62), «35 - 45 m» (r=0,62), «emerge – 65 m» (r=0,54), «85 – 95 m» (r=-0,61), «95 – 100 m» (r=-0,63), «100 m – emerge» (r=-0,63), «145 – 150 m» (r=-0,64), «165 – 175 m» (r=-0,63), «175 - 185 m» (r=-0,58), «195 - 200 m» (r=-0,62).

The most influential on the result are the rates of rowing movements at such

intervals as «145 - 150 m» (r=-0,78) and «165 – 175 m» (r=-0,89). The frequency of movements on the segments «15 - 25 m» (r=-0,64), «95 – 100 m» (r=-0,69), «185 – 195 m» also has a significant effect (r=-0,54).

Closely correlated with the final result of the «step» of the cycle of rowing movements in areas «45–50 m» (r=-0,76) and «185–195 m» (r=-0,91). The average degree of interconnection takes place on the segments «25–35m» (r=-0,67), «35–45 m» (r=0,53), «emerge – 65 m» (r=0,62) and «195 – 200 m» (r=-0,62).

Having identified the parameters that most significantly affect the final sports result on the distance of 200 meters, we have developed their model characteristics (Table 1).

Table 1

Model characteristics of indicators of technical and tactical skill of high-class athletes who specialize in swimming by butterfly stroke at the distance of 200 meters

№	Indicators	Model values
1.	Speed on the segment «25 m – 35 m», m/s	1,66±0,14
2.	Speed on the segment «35 m – 45 m», m/s	1,78±0,12
3.	Speed on the segment «45 m – 50 m», m/s	1,23±0,10
4.	Speed on the segment «50 m - emerge», m/s	1,48±0,31
5.	Speed on the segment «emerge – 65 m», m/s	1,47±0,20
6.	Speed on the segment «85 m – 95 m», m/s	1,63±0,14
7.	Speed on the segment «95 m – 100 m», m/s	1,57±0,21
8.	Speed on the segment «100 m - emerge», m/s	1,56±0,29
9.	Speed on the segment «145 m – 150 m», m/s	1,07±0,17
10.	Speed on the segment «150 m - emerge », m/s	1,42±0,21
11.	Speed on the segment «165 m – 175 m», m/s	1,56±0,10
12.	Speed on the segment «175 m – 185 m», m/s	1,52±0,12
13.	Speed on the segment «185 m – 195 m», m/s	1,46±0,09
14.	Speed on the segment «195 m – 200 m», m/s	1,46±0,29
15.	Pace of rowing movements on the segment «15 m – 25 m», cycles/min	46,65±6,10
16.	Pace of rowing movements on the segment «95 m -100 m», cycles/min	50,34±7,93
17.	Pace of rowing movements on the segment «145 m -150 m», cycles/min	45,30±11,29
18.	Pace of rowing movements on the segment «165 m -175 m», cycles/min	50,59±4,78
19.	Pace of rowing movements on the segment «185 m -195 m», cycles/min	43,74±2,60
20.	«Step» of the cycle of rowing movements on the segment «25 m - 35 m», m	2,07±0,19
21.	«Step» of the cycle of rowing movements on the segment «35 m -45 m», m	2,36±0,24
22.	«Step» of the cycle of rowing movements on the segment «45 m -50 m», m	1,61±0,16
23.	«Step» of the cycle of rowing movements on the segment «emerge-65 m», m	1,83±0,21
24.	«Step» of the cycle of rowing movements on the segment «185 m-195 m», m	2,00±0,01
25.	«Step» of the cycle of rowing movements on the segment «195 m-200 m», m	1,67±2,40

Determining the compliance of indicators of technical and tactical actions of a particular athlete with the developed model characteristics allows the coach to predict the direction of correction of the training process in order to achieve the highest sports results.

Conclusions / Discussion

The results of the study confirm the opinion of many experts that the length of the competitive distance leaves an imprint on the dynamics of technical and tactical skills of highly qualified swimmers. We determined that the distance of 200 meters by butterfly stroke is overcome by athletes with a relatively stable speed and pace of rowing movements. A significant reduction in speed occurs in the first 25 meters of the distance, as well as when atletes swim to the turntable. At the finish meters there is no significant deceleration of the distance speed due to the balance between the pace and the «step» of the rowing movements. It is determined that the speed on the segments «45 -50 m» (r=-0,84), «50 m – emerge» (r=-0,78),«150 m – emerge» (r= -0,85) and «185 – 195 m» (r=-0,91); the pace of rowing movements at such intervals as: «145 - 150 m» (r=-0,78) and «165 – 175 m» (r=-0,89); the «step» of the cycle of rowing movements in the areas «45 – 50 m» (r=-0,76) and «185 – 195 m» (r=-0,91) are most influential on the sports result at a distance of 200 meters by butterfly stroke among the indicators of technical and tactical skill. It can be argued that the comparison of individual characteristics of the structure of competitive activities and special preparedness of specifically athlete with model parameters provides an opportunity to most fully disclose his potential and rationally build a training process.

The prospect of further research is modeling of indicators of the structure of competitive activity and special preparedness of athletes who specialize in butterfly swimming at distances of 50 and 100 meters.

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INTEGRATED DEVELOPMENT OF TECHNICAL AND PHYSICAL PREPAREDNESS OF 7-8-YEARS-OLD FEMALE TENNIS PLAYERS

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Purpose: to research changes in technical and physical preparedness of 7-8-year-old sportswomen under the influence of classes on the program of CYSS.

Material and methods: theoretical analysis and generalization of scientific and methodological literary sources; testing of technical and physical fitness, pedagogical experiment, methods of mathematical statistics. The research involved 7-8-year-old girls in the initial training group of the second year of study.

Results: reliable changes in physical preparedness in in throwing a tennis ball to the range - by 39,8 % ($t=3,70$, $p<0,01$), in the exercise of catching a falling stick - by 12,7 % ($t=5,00$, $p<0,001$); the shuttle run in 5 directions with rackets “Fan” - by 8,9 % ($t=2,40$, $p<0,05$). Positive changes were obtained but had no valid results in other control exercises ($p>0,05$). In technical preparation, positive reliable changes in exercises were obtained: in impacts from the rebound from the wall by 33,3 % ($t=2,20$, $p<0,05$) and in impacts from the rebound through the grid from the coach basket by 56,4 % ($t=2,70$, $p<0,05$). Correctly selected physical fitness exercises allowed the tennis players to approach the ball in time to hit the ball and improve the test results. It was revealed that the improvement in indicators in long jump, throwing a tennis ball at a range and accuracy contributed to an increase in the importance of correlation links to an average

and high level of indicators in hits from the rebound from the wall and through the net, in serve.

Conclusions: the introduction of the methods for the integrated development of physical qualities and technical preparedness under the program of CYSS contributed to reliable changes in indicators. Ways were determined for the further improvement of speed and high-speed and power abilities, serving, and strokes of female tennis players.

Keywords: female tennis players, physical preparedness, indicators, techniques.

Introduction

The effective improvement of fitness of young tennis players remains one of the urgent problems in the modern conditions of sports training. To achieve success in tennis, sportsmen need adequate physical, technical, tactical, and psychological training, the high level of which is laid down already at the initial stage of training.

One of the most important trends in the development of modern tennis is the search for new, more effective, means and methods of training. In their scientific works, experts argue that developed physical qualities are extremely necessary for a successful game of tennis [7, 9].

The training programs for tennis players describe the structure of the training process and the sequence of exercises at the initial preparation stage [4, 11, 12]. The analysis of methods of children's preparation at the initial stage in tennis indicates the orientation of the training process towards the development of physical qualities, especially speed and high-speed and power character, coordination abilities, mastery of the main elements of the game and gradual inclusion in competitive activities among children of their age contributes to a further increase in the level of fitness of sportsmen [8, 13].

To determine the level of physical and technical fitness of tennis players, in particular, at the initial training stage, a number of tests are used according to the CYSS program [1, 5].

At the same time, the search for effective methods of training in tennis at the stage of initial training contributes to a stronger foundation for the preparedness of

sportsmen and high results in further competitive activities, which indicates the relevance of the chosen topic.

Connection of the research with scientific and practical tasks, plans, programs. The research was carried out in accordance with the theme of the RW plan of Kharkiv state academy of physical culture. The initiative topic is "The improvement of the educational and training process in sports games". RW state registration number: 0119U101644 (2019-2023).

Purpose of the research is to investigate changes in technical and physical fitness of 7-8-year-old female tennis players under the influence of classes under the CYSS program.

The research tasks:

1. To determine the level of technical and physical fitness of female tennis players.

2. To investigate changes in technical and physical fitness of female tennis players under the influence of classes under the CYSS program.

3. To establish relationships between indicators of technical and physical fitness of 7-8-year-old female tennis players.

Material and Methods of research

The research involved 12 girls aged 7-8 years in the initial training group of 2 years of study. The research was carried out for 5 months on the basis of the tennis club "Khvylia" in Kharkiv.

Testing of technical preparedness indicators was carried out on exercises: rebound from the wall, rebound through the grid from the coaching basket, serving through the grid, volleys through the grid. To determine the physical fitness of young female tennis players, control exercises were used: throwing a tennis ball to the range, running 18 m; shuttle run in 5 directions; catching a falling stick; long jump; getting in a serve with the leading hand.

The pedagogical experiment took into account the results of preliminary tests of the fitness level of sportswomen and determined the method of training female tennis players. The method used exercises and methods that contributed to a

comprehensive increase in the physical and technical fitness of sportswomen. The methodology was used according to the CYSS program [1, 4] for sportswomen of the initial training group 2 years of training in tennis. The training was carried out 3 times a week for 1,5 hours. At the end of the preparatory and at the beginning of the main part of the training, exercises were performed for the integrated development of coordination, speed abilities, and technical preparedness of sportswomen. At the end of the lesson, comprehensive training of high-speed and power abilities and endurance was carried out along with the improvement of the technical preparedness of female tennis players. Classes were held using the game method using outdoor games.

Exercises were used for speed and high-speed and power abilities for the development of physical fitness, namely, various jumps: long lumps, side-up, up, up-back from the place, from the run, various jumps with a racecourse; throwing a tennis ball to the range, starts from different positions with rackets, running exercises with acceleration; for coordination abilities - catching a tennis ball in various positions at the initial moment and at the top of its rebound, throwing a tennis ball to the ground from different distances, exercises with balls and rackets on the coordination ladder; for endurance - normal long run, interval running sideways and backs forward with acceleration, for the development of strength - exercises with an expander for the hand, throwing the stuffed ball with movements that are similar to performing strokes on the left, right, serving, bending the extension of the hands, lying. After mastering the exercises, sportswomen performed training tasks using the playing and competitive method.

Attention was paid to the approach to the ball, performing hits and moving to the starting position, exercises with the ball on the spot and in the movement were used in specially preparatory means, various racket hits were performed on the ball from a rebound, volleys, and serves in technical training. Female tennis players learned to keep the ball in the game, lead the game to the score.

Results of the research

The primary pedagogical testing revealed that the development indicators of 7-8-year-old female tennis players have satisfactory results for this age in accordance with the standards of CYSS [1, 4].

After the pedagogical experiment, reliable changes in physical fitness indicators of female tennis players in exercises were revealed: for speed and high-speed and power - throwing a tennis ball to the range, the average result increased by 39,8 % ($t=3,70$, $p<0,01$) and catching a falling stick by 12,7 % ($t = 5,00$, $p<0,001$); for dexterity and high-speed endurance in the shuttle run in 5 directions with rackets "Fan", the result increased by 8,9 % ($t=2,40$, $p<0,05$). In other control exercises, positive changes were obtained but had no valid results. So, the result in run on 18 m increased by 18,8% ($t=1,10$, $p>0,05$); in the test "standing long jump" by 9,4 % ($t=1,50$, $p>0,05$), in getting in a serve with the leading hand – 29,2 % ($t=2,00$ $p>0,05$). (Tab. 1).

Table 1

Changes in physical fitness of female tennis players after the pedagogical experiment (n=12)

№	Control exercises	Before the experiment n=12	After the experiment n=12	Confidence assessment	Changes in indicators, %
				t; p	
		Xav.± m	Xav.± m		
1	Throwing a tennis ball to the range, (m)	10,3±0,20	14,4±1,10	**t=3,70 p<0,01**	39,8
2	Shuttle run in 5 directions with rackets "Fan", (s)	19,2±0,40	17,5±0,60	**t=2,40 p<0,05**	8,9
3	Standing long jump, (cm)	131,4±3,50	143,8±7,60	t=1,50 p>0,05	9,4
4	Run on 18 m (s)	4,8±0,20	3,9±0,80	t=1,10 p>0,05	18,8
5	Catching a falling stick, (cm)	19,8±0,40	17,3±0,30	**t=5,00 p<0,001**	12,7
6	Getting in a serve with the leading hand, from 12 times, (number of hits)	4,8±0,40	6,1±0,50	t=2,00 p>0,05	29,2

The obtained unreliable results in run on 18 m, in standing long jumps and in getting in a serve with the leading hand indicate the need to use more exercises to develop starting speed and running along the distance, performing various leaps forward, on the other hand, sure to develop high-speed and power abilities and improve coordination.

In technical preparation, reliable changes in exercises were obtained: in impacts from the rebound from the wall by 33,3 % ($t=2,20$, $p<0,05$) and in impacts from the rebound through the grid from the trainer's basket by 56,4 % ($t=2,70$, $p<0,05$). The net feed results improved by 37,5 % ($t=0,39$) and volleys through the grid increased by 23,1 % ($t=0,83$), but hadn't significant changes ($p>0,05$) (Table 2).

The analysis of technical preparedness indicators of female tennis players shows that the level of possession of the racket and the performance of technical techniques with the ball improved, but sportswomen need to develop coordination abilities such as the ability to spatiotemporal orientation, coordination of movements, to develop a sense of the ball.

Table 2

Changes in technical fitness of female tennis players after the pedagogical experiment, (n = 12)

Control exercises	Units of measurement	Testing indicators		Confidence assessment	Changes in indicators %
		Before the experiment n=12	After the experiment n=12	t; p	
		Xav.± m	Xav.± m		
Volleys through the grid	hits	1,3±0,20	1,6±0,30	t=0,83 p>0,05	23,1
Bounces from the wall	hits	10,8±1,20	14,4±1,10	**t=2,20 p<0,05**	33,3
Bounce strokes through the grid	hits	3,9±0,40	6,1±0,70	**t=2,70 p<0,05**	56,4
Serves through the grid	hits	0,8±0,30	1,1±0,70	t=0,39 p>0,05	37,5

The correlation analysis identified significant relationships of indicators before the pedagogical experiment (Table 3). So, the average level of feedback turned out to be between throwing a tennis ball to the range and shuttle run "Fan" (r =-0,71).

Bounce strokes through the grid have average relationships with standing long jump (r=0,69), getting in a serve with the leading hand (r = 0,77), and bounce from the wall (r=0,73). Serve indicators correlate with bounce strokes through the grid (r=0,67).

The high level of significance of the indicators turned out to be between getting in a serve with the leading hand and standing long jump (r=0,94), which indicates a dependence of coordination and high-speed and power abilities for the correct performance of the technical exercise by sportswomen.

Table 3

Relationship of indicators of technical and physical fitness of female tennis players before the pedagogical experiment, (n = 12)

	1	2	3	4	5	6	7	8	9	10
1	1									
2	**-0,71**	1								
3	0,51	-0,27	1							
4	-0,51	0,41	-0,29	1						
5	-0,42	0,47	-0,36	0,59	1					
6	0,37	-0,15	**0,94**	-0,12	-0,14	1				
7	0,18	-0,40	-0,18	-0,52	-0,39	-0,21	1			
8	0,44	-0,58	0,17	-0,41	-0,06	0,30	0,52	1		
9	0,59	-0,49	**0,69**	-0,34	-0,14	**0,77**	0,34	**0,73**	1	
10	0,24	0,11	0,34	0,13	0,26	0,49	0,22	0,28	**0,67**	1

Note. 1-6 indicators of physical fitness: 1-throwing a tennis ball to the range (m); 2- shuttle run "Fan"(s); 3- standing long jump; 4-run on 18 m (s); 5- catching a falling stick (cm); 6- get in a serve with the leading hand (hit) **7-10 technical readiness indicators:** 7- hit of the rally through the net (hit); 8- bounce from the wall (hit); 9- bounce from the bounce through the grid (hit); 10- supply through the grid to the target (hit).

After the pedagogical experiment, more significant connections between the indicators of technical and special physical fitness were determined (Table 4). The average level of connections revealed between the indicators of standing long jump with throwing a tennis ball to range (r=0,63) and shuttle run "Fan" (r=0,60) respectively indicate the selection of exercises for the development of high-speed and power abilities of sportswomen. The correlation of connections in tennis ball throws

at the range and tennis ball throws at the accuracy (r=0,72) shows the improvement in the performance of the supply elements by female tennis players. This opinion is supported by the average relationship of the performance of the serve to range (r=0,73), to standing long jump (r=0,64), to volleys (r=0,69), and high significance with rebound strokes through the grid (r=0,84), but this wasn't enough for the reliability of the feed results.

High and medium connections between volleys and rebound strokes (r=0,74) and rebound strokes through the grid (r=0,87) indicate the increase in the level of racket ownership among female tennis players, the increase in the accuracy of performing various strokes.

Inverse correlations were found in indicators catching a falling stick with blows from the rebound through the grid (r=-0,72) and the supply (r=-0,66) emphasizes the presence of errors in the sportswomen in the technical performance of strokes. Errors in performing strokes in movement can explain the inverse relationships between the indicators of strokes from the rebound through the grid and run on18 m (r=-0,72).

Table 4

Relationships of technical and physical fitness indicators of female tennis players after the pedagogical experiment, (n = 12)

Indicators	1	2	3	4	5	6	7	8	9	10
1	1									
2	0,16	1								
3	**0,63**	**0,60**	1							
4	-0,27	0,15	-0,06	1						
5	-0,45	0,25	-0,38	0,37	1					
6	**0,72**	-0,09	0,31	-0,25	-0,59	1				
7	0,21	0,18	0,43		-0,49	0,04	1			
8	0,34	0,21	0,49	-0,51	-0,46	0,45	**0,74**	1		
9	0,40	-0,14	0,29	**-0,71**	**-0,72**	0,28	**0,87**	**0,68**	1	
10	**0,73**	0,13	**0,66**	-0,41	**-0,66**	0,38	**0,69**	0,58	**0,84**	1

Note. 1-6 indicators of physical fitness: 1-throwing a tennis ball to the range (m); 2- shuttle run "Fan"(s); 3- standing long jump; 4-run on 18 m (s); 5- catching a falling stick (cm); 6- get in a serve with the leading hand (hit) **7-10 technical readiness indicators:** 7- hit of the rally through the net (hit); 8- bounce from the wall (hit); 9- bounce from the bounce through the grid (hit); 10- supply through the grid to the target (hit).

Conclusions / Discussion

The analysis of scientific and methodological literature indicates the relevance of the research. The results are supported by the authors' researches [2, 4, 8]. The data of domestic [7, 11] and foreign [13, 14, 15] authors were also expanded, who were engaged in the search for effective methods for improving the fitness of sportsmen in tennis. The results of physical fitness after the pedagogical experiment revealed shortcomings in the development of starting speed, speed-power fitness, and coordination abilities of female tennis players and determined the need for further directed selection of training means and methods. The need for such exercises at the initial training stage was emphasized in their affairs by scientists [2, 3, 9].

Analyzing the results of technical preparation, reliable positive changes in female tennis players were in bounces from the wall, rebounds. Properly selected physical fitness exercises, namely, the development of the muscles of the hand and forearm, legs and muscles of the trunk, various movements from various positions with a variable rate of execution, the number of steps allowed to be correctly suited to perform the impact, to hold the racket well and to improve the test results in impacts. Insufficient accuracy of the feed and hit of the rally affected unreliable changes in the test results. When performing all the exercises, the coach demanded that the female tennis players not only accurately hit the target, but also properly perform the technical technique. The results are supported by the authors' researches [1, 4, 8, 11]. The primary pedagogical testing revealed that the indicators have satisfactory results for this age by the standards of CYSS.

The applied methodology of the complex development of physical qualities and technical preparation under the CYSS program contributed to reliable positive changes in indicators of physical fitness of female tennis players in throwing a tennis ball to the range of 39,8 % ($t=3,70$, $p<0,01$), catching a falling stick by 12,7 % ($t=5,00$. In other control exercises, positive changes were obtained but had no valid results ($p>0,05$).

In technical preparation, positive reliable changes in exercises were obtained: in impacts from rebound from the wall by 33,3 % ($t=2,20$, $p<0,05$) and in impacts

from the rebound through the grid from the coach's basket by 56,4 % ($t=2,70$, $p<0,05$).

The correlation analysis after the pedagogical experiment confirmed the relationship between physical and technical fitness indicators. It was revealed that the improvement in indicators in the long jump, throwing a tennis ball to the range, and accuracy contributed to the increase in the importance of connections to average and high levels of indicators in hits from a rebound from the wall and through the grid, as well as in the feed.

Thus, it can be determined that the introduction of the methodology for the integrated development of physical qualities and technical training under the CYSS program contributed to reliable changes in indicators. Ways were determined for further improvement of speed, high-speed and power, and coordination abilities, serves and strokes of female tennis players.

Prospects for further researches. Based on the above, further researches are planned to be carried out in the direction of determining the impact of psychophysical abilities on the technical and tactical indicators of fitness of female tennis players at the stage of initial training.

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ESTABLISHMENT OF THE CORRELATION DEPENDENCE OF MASTERING BASIC EXERCISES IN SPORTS ACROBATICS ON THE USE OF INDIVIDUAL SPECIAL PREPARATORY EXERCISES BY YOUNG ACROBATS 6-7 YEARS OLD

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Purpose: to determine the correlation relationship between the basic exercises of the initial training of young acrobats and special preparatory exercises used to master them.

Material and Methods: the research was carried out on the basis of the complex children's sports school No. 6, Slobodsky district of Kharkov. 14 children 6-7 years old took part in the study, they were engaged in sports acrobatics in sports and health-improving groups, for whose participation parental consent was obtained. At the beginning of the study, after introductory sessions, control testing of the basic exercises "swallow", "forward roll", "wheel", "birch" "crab position", development of motor qualities, necessary for the fulfillment of the specified basic exercises, and repeated testing was carried out, the assessment of which was carried out on a 10-point scale. After that, a correlation analysis of the dependence of basic acrobatic exercises on special preparatory exercises that were used to perform them was carried out.

Results: in the process of using complexes of special preparatory exercises, the quality of basic exercises performance was increased due to the use of special preparatory exercises in the "swallow" exercise ($t=3,94$; $p<0,001$), "forward roll"

(t=2,90; p<0,05), "wheel" (t=2,12; p<0,05), "birch" (t=2,67; p<0,05), "crab position" (t=2,59; p<0,05).

Conclusions: as a result of the research, a correlation has been established between basic acrobatic exercises and individual special preparatory exercises used during their training.

Keywords: basic acrobatic exercises, young acrobats, correlation.

Introduction

At the stage of initial training in the learning process, the main thing is the assimilation of the simplest elements of acrobatics, which are further improved, more complex elements are mastered, combined into competitive compositions [12, 13, 14].

At the same time, a young athlete has a versatile technical base, which contributes to mastering a wide range of various motor actions [1, 7, 9]. This approach is the basis for further technical improvement. This provision also applies to the subsequent basic stages of long-term training, however, it is especially necessary to take it into account during the initial training period [3, 4, 8, 10].

When mastering the basic elements of sports acrobatics, it is important to combine in one training lesson, both individual acrobatic exercises and special preparatory exercises for their formation [11]. There are several approaches to the construction of training sessions: in one lesson to solve the problems of mastering a separate basic exercise of a sports acrobat; in one lesson, master two basic exercises that are similar in structure of movements (for example, "birch" and "crab position"), in which special preparatory exercises are recommended, for example, "crab position from support on the shoulders"); in one lesson, sequentially assimilate at first less complex basic exercises with their gradual complication with special exercises [5, 6, 14].

Therefore, when planning training sessions, it is very important to take into account the influence of individual physical exercises for the formation of the basic elements of sports acrobatics in young athletes 6-7 years old.

Purpose of the study is to determine the correlation relationship between basic exercises of initial training of young acrobats and special preparatory exercises used for their assimilation.

Material and Methods of research

The research was carried out in 2 stages. At the first stage, the complex effect of special preparatory exercises on individual basic exercises in sports acrobatics was determined. On the second, a correlation was established between basic acrobatic exercises and special preparatory exercises that contribute to the assimilation of the technique of their implementation.

Results of the research

The results of the research carried out at the first stage are presented in Table 1.

The assessment of the performance of the exercises was carried out on a 10-point scale with a decrease: minor errors – 0,1 points, significant errors – 0,2-0,3 points, gross errors – 0,5 points, falling – 1,0 points [11].

All static individual elements must be observed for 2 seconds. For each second observed when performing an individual stage element, 0,3 points are deducted. If an individual element is fixed for less than 1 second, its assessment is removed.

The results obtained testify to the effectiveness of the developed and implemented methodology of using various special preparatory exercises for mastering the basic elements of sports acrobatics at the initial stage of training.

It should be noted about the unequal influence of the sets of exercises used. So, in general, the use of the experimental methodology for the use of special exercises significantly influenced the simpler exercises: the performance of the "swallow" improved by 1,3 points ($t=3,94$; $p<0,001$), the "forward roll" - by 0,9 points ($t=2,90$; $p<0,05$), "birches" - by 0,8 points ($t=2,67$; $p<0,05$), "crab position" - by 0,8 points ($t=2,59$; $p<0.05$). In turn, the performance of the most difficult exercise, the "wheel", was less influenced ($t=2,12$; $p>0,005$) by special preparatory exercises, which requires their further application. Along with this, it is important to determine the effectiveness of exercises that affect the performance of basic elements, which will allow the use of those that, in their structure of movements and the dynamics of their

implementation, most correspond to the basic right. This especially concerns the most complex in terms of dynamic structure of movements, which, first of all, concerns the basic exercise at the initial stage of preparation - the "wheel".

Table 1

Influence of special preparatory exercises for mastering basic exercises in sports acrobatics at the stage of initial training, x±m; n1=n2=14

Exercise	At the beginning	Special preparatory exercises	At the end	t	p
«Swallow»	4,8±0,22	- standing facing the gymnastic rack, swinging legs; - maintaining balance, standing on one leg against the gymnastic wall; - balance, independently hold from 3-4 s to 10-12 s; - balance with closed eyes.	6,1±0,24	3,94	<0,001
«Forward roll»	4,2±0,20	- rolls forward and backward in a tuck, lying on the back; - sitting in a group, roll back and forth, pushing off with hands at the head; - in support in the squatting position, bending the arms and tilting the head until the back of the head touches the floor.	5,1±0,23	2,90	<0,05
«Wheel»	3,6±0,22	- squats, jumps, stretches during warm-up; - handstand against the wall; - side stand; - 360° turns; - jumping from foot to foot in a stance "triangle".	4,3±0,24	2,12	>0,05
«Birches»	4,0±0,20	-head tilts to the sides, forward, backward; - flexion and extension of the arms in support lying on the floor; - maximum forward bends of the trunk; - squats to the parallel position of the thighs relative to the floor; - flexion of the legs at the knee joints, lying on the back.	4,8±0,22	2,67	<0,05
«Crab position»	4,2±0,21	- crab position from support on the shoulders; - "reverse bar"; - entrance to the crab position from the gymnastic bench; -semi crab position; - entrance to the crab position with support along the wall	5,0±0,28	2,59	<0,05

In this connection, we carried out a correlation analysis of the effectiveness of the use of special exercises, which were used during initial training to master the basic elements of sports acrobatics.

As evidenced by the results obtained, the most effective exercise is the exercise of maintaining balance, standing on one leg for a long time (up to 10-12 s) and maintaining balance with closed eyes on one leg (r=0,60) as the most appropriate in terms of the structure of movements of the exercise "swallow "(Table 2).

Table 2

Matrix of correlation dependence of special preparatory exercises and the implementation of the basic acrobatic exercise "swallow"

№ i/o	Exercises	Correlation coefficient
1	Standing facing the gymnastics rack, swinging legs	0,42
2	Maintaining balance, standing on one leg against the gymnastic wall	0,56
3	Maintaining balance on one leg from 3-4 s to 10-12 s	0,64
4	Balance on two legs with closed eyes	0,48
5	Balance on one leg with closed eyes	0,60

At the same time, these special exercises are the most difficult to perform, so they should be used after applying other, less difficult (swinging legs, standing facing the gymnastic rack maintaining balance, standing on one leg to the gymnastic rack performing balance on two legs with closed eyes).

The exercises used for mastering the "forward roll" are effective, since the correlation is at the level of the average (r=0,50-0,60): rolling forward and backward in a group, lying on the back is an integral part of the specified basic exercise on the initial stage (r=60) (Table 3).

Table 3

Matrix of correlation dependence of special preparatory exercises and the implementation of the basic acrobatic exercise "forward roll"

№ i/o	Exercises	Correlation coefficient
1	Roll forward and backward in a tuck, lying on your back	0,60
2	Roll back and forth, sitting in a tuck, pushing off with hands at the head	0,58
3	In the support in the squat position, bending the arms and tilting the head until the back of the head touches the floor	0,50

The first can be used an exercise associated with fixing the initial position in support from a squat, bending the arms and tilting the head until the back of the head touches the floor, and then rolls forward and backward.

The most important and most difficult to perform is the basic exercise "wheel", which requires the manifestation of the dynamics of movements with a change in the positions of body parts in space. Therefore, the most significant elements are those that allow fixing the handstand against the wall (r=0,60) (Table 4).

Table 4

Matrix of correlation of special preparatory exercises and the implementation of the basic acrobatic exercise "wheel"

№ i/o	Exercises	Correlation coefficient
1	Squats, jumps, stretches during warm-up	0,41
2	Handstand against the wall	0,61
3	Side stand	0,60
4	360° turns	0,58
5	Jumping from foot to foot in a stance "triangle"	0,56

In turn, an exercise associated with spatial orientation with the participation of the vestibular analyzer with a change in the position of the athlete's body is important.

Perform basic acrobatics "birch" requires the involvement of the abdominal muscles to bring the legs from a horizontal to a vertical position, so the most effective is the use of specially-preparatory exercises "leg flexion in the knee joints, lying on back» (r=0,58) and "raise legs, sitting on a bench ”(r=0,65) (Table 5).

Table 5

Matrix of correlation dependence of special preparatory exercises and the implementation of the basic acrobatic exercise "birch"

№ i/o	Exercises	Correlation coefficient
1	Head tilts to the sides, forward, backward	0,32
2	Flexion-extension of the arms in support lying on the floor	0,52
3	Maximum forward bends of the trunk	0,48
4	Squats to the parallel position of the thighs relative to the floor	0,49
5	Flexion of the legs in the knee joints, lying on the back	0,58
6	Raising legs while sitting on a bench	0,65

It is also important to maintain the "crab position"; this requires a significant level of strength qualities of the upper extremities, which is facilitated by the use of a special preparatory exercise "flexion-extension of the arms in the lying position" (r=0,52).

The exercises, which were used to master the basic element of sports acrobatics "crab position", provide for motor actions for the implementation of the exercise and the content of the posture (its individual components) in a static position (Table 6).

Table 6

Correlation matrix of special preparatory exercises and the implementation of the basic acrobatic exercise "crab position"

№ i/o	Exercises	Correlation coefficient
1	Crab position from support on the shoulders	0,56
2	Reverse bar	0,54
3	Entrance to the crab position from the gymnastic bench;	0,60
4	Semi crab position	0,58
5	Entrance to the crab position with support along the wall	0,64

All special exercises are essential for the formation of individual components of the basic exercise "crab position" with support along the wall (r=0,64) and "entrance to the crab position from the gymnastic bench" (r=0,60).

Conclusions / Discussion

The assimilation of the basic elements of acrobatics among young athletes requires a certain level of development of motor qualities, ensuring their fulfillment [14]. At the same time, the effectiveness of the use of special preparatory exercises depends on the structure of their movements for the basic exercise [2]. Therefore, it should be borne in mind that the use of special exercises should provide for the opportunity to significantly contribute to the formation of motor qualities aimed at the effectiveness of the structure of basic acrobatic exercises fulfillment.

Our research has made it possible to:

1. To determine the influence of the use of complexes of special preparatory exercises on the quality of the basic acrobatic exercises of young acrobats 6-7 years old, it was possible to increase the score in the exercises "swallow" by 1,3 points ($t=3,94$; $p<0,001$), "forward roll" by 0,9 points ($t = 2,90$; $p<0,05$), "birch" by 0,8 points ($t=2,67$; $p<0,05$), "crab position" by 0,8 score ($t=2,59$; $p<0,05$).

2. The correlation dependence of the fulfillment of basic exercises of initial sports acrobatics and special-preparatory exercises providing the fulfillment of exercises was established: "swallow" has an average level of correlation with

exercises: maintaining balance, standing on one leg, to the gymnastic wall (r=0,56), holding balance on one leg from 3-4 s to 10-12 s (r=0,64), performing balance on one leg with closed eyes (r=0,60) "forward roll" with rolling forward and backward in a group, lying on the back (r=0,60); roll back and forth, sitting in a tuck, pushing off with hands at the head (r=0,58) in support in the squat position, bending the arms and tilting the head until the back of the head touches the floor (r=0,50) "wheel" with a handstand at walls (r=0,61), "side stand" (r=0,60), 360° turns (r=0,58), jumping from foot to foot in a "triangle" stand (r=0,56) "birch" with flexion-extension of the arms in the support lying on the floor (r=0,52), flexion of the legs in the knee joints, lying on the back (r=0,58), raising the legs while sitting on a bench (r=0,65) "crab position" with a crab position from the support on the shoulder (r=0,56), "reverse plank" (r=0,54), entrance to the "crab position" from the gymnastic bench (r=0,60), "semi crab position" (r=0,58), entrance to the "crab position" with support along the wall (r=0,64).

Prospects for further research. The results obtained make it possible to purposefully use separate special preparatory exercises in the construction of training in basic acrobatic exercises for young novice athletes.

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SIMULATION OF THE YEARLONG CYCLE OF TRAINING OF ATHLETES IN AEROBIC GYMNASTICS AT THE STAGE OF SPECIALIZED BASIC TRAINING

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Purpose: to develop a model of the annual training cycle for athletes 12-14 years old, specializing in aerobic gymnastics, based on the well-known methodology in complex coordination and gymnastic sports, taking into account the specifics of this sport.

Materials and methods: the study involved 24 athletes aged 12-14 years (girls). Research methods: analysis and generalization of scientific and methodical literature data, pedagogical observation, pedagogical testing, pedagogical experiment and methods of mathematical statistics.

Results: the specificity of aerobic gymnastics as a sport has been investigated. Revealed and practically substantiated effective means, methods and training loads of the stage of specialized basic training. The level of development of physical qualities, special physical fitness and technical skill of athletes 12-14 years old has been

determined and established. It has been experimentally proved and mathematically proven that the developed model of the annual training cycle is the most effective for determining the readiness for competitive activity of 12-14 year old athletes engaged in aerobic gymnastics at the stage of specialized basic training.

Conclusions: the proposed model of the annual cycle of training athletes aged 12-14, engaged in aerobic gymnastics at the stage of specialized basic training leads to increased development of individual physical qualities, increasing the level of special training and athletes gain stability and quality of technical elements.

Keywords: aerobic gymnastics, model, annual training cycle, athletes 12-14 years old, stage of specialized basic training.

Introduction

Aerobic gymnastics is one of the modern sports. Currently, the International Federation of Aerobic Gymnastics unites the national federations of many countries [3, 6]. It is complex, spectacular and at the same time accessible sport for people of all ages and genders. The growing interest in aerobic gymnastics, its geographical expansion, the holding of European, Ukrainian and world championships, participation of Ukrainian athletes on the international arena indicate the need to identify and develop theoretical and practical issues regarding this sport promotion [3, 6].

These issues facing the specialists of aerobic gymnastics concern the already accumulated experience in the literature from such sports as gymnastics, acrobatics, figure skating, synchronized swimming, etc. [8, 9, 13]. But each sport has its own characteristics of building the training process [1, 2, 11, 12 etc]. Aerobic gymnastics is an independent type of gymnastics. It has a very specific system of learning, training and judging [3, 6], but at present the problems of formulating the methodology of aerobic gymnastics have not been confirmed yet. On the one hand the relevance of modeling the annual cycle of training in aerobic gymnastics is determined by the practice demand. On the other hand, it's determined by the lack of scientifically grounded practice of the sports training. The expert research [4, 5, 7, 12,

15 etc] convincingly shows that the effectiveness of the athlete's trainings increasingly depends on the rational planning of training loads in different periods and stages of annual preparation.

Connection of study with scientific programs, plans, topics, programs. The study was conducted in accordance to initiative theme of scientific research done by Department of gymnastics, dancing sports and choreography Kharkov State Academy of Physical Culture: "Theoretical and methodological bases of development of system-forming components of physical culture (sport, fitness and recreation)" for 2020-2025 (state registration number 0120U101215).

Purpose of the study: to develop a year-long cycle model of training for the athletes that specialize in aerobic gymnastics, based on prominent methodology in complex coordination and gymnastic sports considering specifics of given sport.

Material and Methods of research

The study was conducted on the basis of the Kharkov's municipal institution for children's and youth sports school № 13. 24 aerobic gymnasts (12-14 years old) took part in this experiment. The informed consent to participate in this experiment was received from each of the contestants' parents. Two groups of gymnasts were formed (control and basic – 12 people each), judging by the average indicators of physical development, special physical fitness and technical skill of the athletes no significant differences were found. ($p>0,05$).

The pedagogical experiment was carried out in groups of specialized basic training throughout the year. Classes were held 6 times a week lasting 150 minutes. The control group studied according to the training program for Children's and Youth Sports Schools [6]. The main group was introduced the model of the yearlong training cycle included the author's tools, methods and techniques of special exercises which allow purposefully develop physical qualities, increase the level of special physical fitness, train and improve techniques. The model is based on the specifics of motor activity of this sport (performing high-intensity and interval work), sensitive periods of development of physical qualities of athletes 12-14 years, goals and objectives of the stage of the specialized basic training.

To solve the issue there were used such research methods as analysis of scientific and methodical literature and documentary; questionnaire; pedagogical observation (in particular by video recording, analysis and evaluation of results to understand the dynamics of qualitative and quantitative characteristics of competitive activities and individual sportsmanship and training loads of athletes in aerobic gymnastics); pedagogical testing (to correct the tactic and the strategy of trainings); pedagogical experiment; expert estimation (to identify and predict the degree of effectiveness of the results of the study); pedagogical testing and biomedical examinations to determine the level of physical preparation; methods of mathematical statistics (modeling and systematization), using the licensed packages of statistical computer programs such as "EXCEL", "SPSS" and "Statistics" to summarize the results and draw the objective conclusions.

The choice of tests to obtain information about the level of evaluation of special physical and technical fitness was made on the analysis of the dominant motional regime of competitive exercises and the specifics of aerobic gymnastics, age of athletes and the requirements of modern competition rules. It was also based on recent conducted studies in complex coordination sports (sport and rhythmic gymnastics, acrobatic gymnastics, ice skating, etc.) [8, 9, 13]. In this way, there was developed and used a set of control exercises to assess the level of special physical fitness of athletes 12-14 years old. It's substantiated by the authors and meet the requirements of the theory of test standardization and sports metrology [1, 2, 7].

Results of the research

On the basis of the analysis of scientific-methodical literature, video, pedagogical monitoring and experiment we have developed a model of two-cycle training for athletes for ages 12-14 who do gymnastics at the stage of specialized basic training. Its essence consists in distribution of effective methods and in their distribution according to the period of preparation, methods and methodical practices, and volumes of the training load.

The author's model of two-cycle annual training of aerobic gymnastics athletes is aimed at forming a specific functional base for effective training and improvement

of element technique. It’s also presented as a basis for studying the most complex technical elements and combining them into connections.

The content of the two-cycle annual training was formed from various exercises used in the practice of sports training in order to improve the training of athletes, were substantiated and completed author's complexes, training tools for the nature of their bioenergy support:

1) aerobic exercise: individual warm-up exercises; stretching and stretching, choreography (machine), training aerobic connections, improvement of technical elements and their connections;

2) load of aerobic-anaerobic orientation: complexes of circular training, acrobatics, jumps during choreography, training of technical elements in parts, completely and in combination with elements of acrobatics;

3) load of anaerobic-glycolytic orientation: performance of whole and "double" competitive compositions, developed varieties of special exercises. The I complex consists of 10-20 special basic exercises of aerobic gymnastics, duration of performance of one exercise - 10-20 seconds, intervals of rest between series of 40-120 seconds (the general duration of the I complex is 15-30 minutes). Depending on the training period, individual parameters change (pace, number and duration of exercises, series and intervals of rest); II complex consists of 8-15 special basic exercises for aerobic gymnastics, the duration of one exercise to a sharp violation of technique ("to failure"), rest intervals between series of 2-6 minutes (total duration of 30-40 minutes).

The dynamics of indicators of special technical readiness in the process of introduction of experimental model two - cycle annual training is revealed and determined, the actual material of the level of development of special physical training of athletes of the main group (MG) and control group (CG) is presented in table 2.

Table 1

Model of two-cycle annual training of athletes 12-14 years old engaged in aerobic gymnastics at the stage of specialized basic training

	Periods of preparation																								
	Preparatory								Competitive						Transitional				Preparatory						
	Month																								
	September				October				November				December				January				February				
	Week																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	The amount of basic parameters in the weekly microcycle																								
Number training days a week	4	4	4	4	5	5	5	5	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5
Number workouts per day	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1
Training duration (min)	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	120	160	120	160	120	160
***GPT-SPT-TT (%)**	20 – 40 – 20				10 – 30 – 40				10 – 20 – 70						20 – 30 – 30				15 – 30 – 25						
***CH-A-AC (%)**	10 (X) – 10 (A)				5 (X) – 5 (A)				—						10 – 10				15 – 15						
Psychological and tactical training	During the year																								
Educational training camps	During the summer holidays																								
Medical examination	Before the competition																								
Ways to recover athletes	During the year																								

*** Note: GPT** – general physical training; **SPT** – special physical training; **TT** – technical training; **CH** – choreography; **A** – acrobatics; **AC** – author's complexes.

Continuation of the table 1

	Periods of preparation																									
	Competitive									Transitional				Preparatory												
	Month																									
	March				April					May				June				July					August			
	Week																									
	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
	The amount of basic parameters in the weekly microcycle																									
Number training days a week	4	4	4	4	4	4	4	4	4	3	4	3	4	3	4	3	4	4	5	5	6	6	6	5	5	5	4
Number workouts per day	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
Training duration (min)	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	120	120	120	160	160	160	160	160	120	120
***GPT-SPT-TT (%)**	10 – 20 – 70									20 – 25 – 25				20 – 20 – 20				15 – 15 – 20									
***CH-A-AC (%)**	—									15 – 15				20 – 20				25 – 25									
Psychological and tactical training	During the year																									
Educational training camps	During the summer holidays																									
Medical examination	Before the competition																									
Ways to recover athletes	During the year																									

*** Note: GPT** – general physical training; **SPT** – special physical training; **TT** – technical training; **CH** – choreography; **A** – acrobatics; **AC** – author's complexes.

Table 2

Indicators of the level of development of special physical fitness of gymnasts at the stage of specialized basic training before and after the experiment

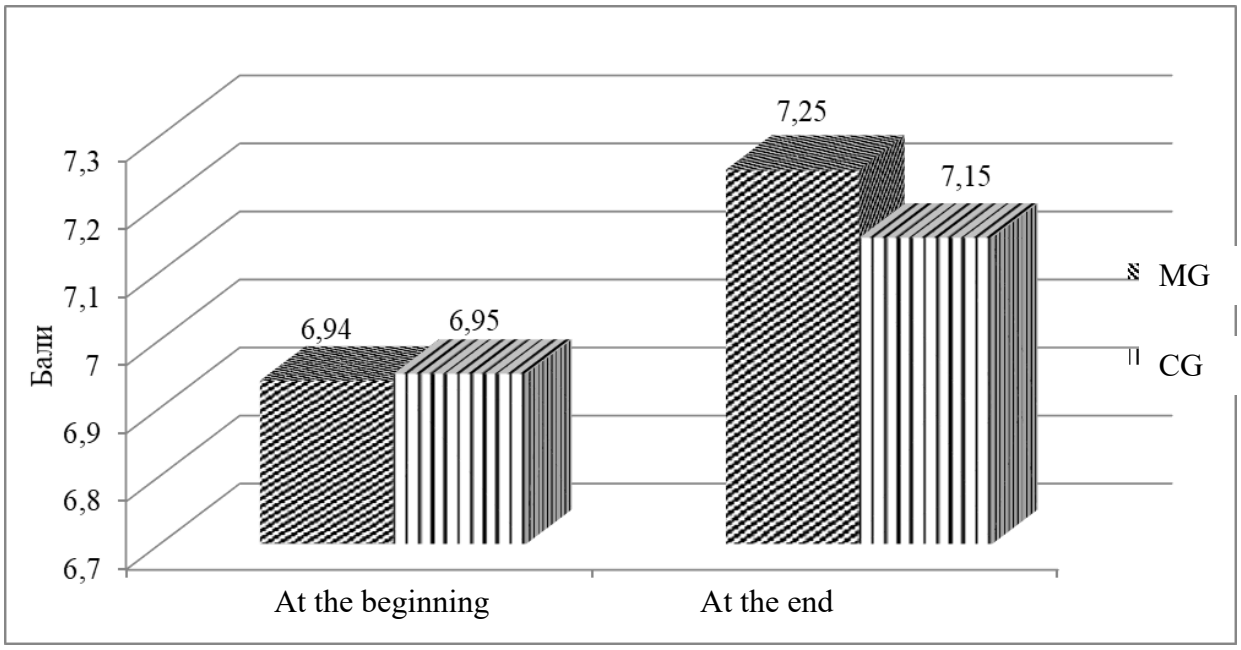
№ n/o	Indexes	Main group (n=12)				Control group (n=12)			
		ID*	FD	%	t; p	ID	FD	%	t; p
		($\overline{X}\pm\sigma$)*	($\overline{X}\pm\sigma$)			($\overline{X}\pm\sigma$)	($\overline{X}\pm\sigma$)		
Coordination skills									
1	Shuttle running 3 x 10 (s) *	10,78±2,5	10,66±2,2	1,01	3,21<0,05	10,65±2,1	10,72±1,9	0,25	3,12<0,05
2	"Flamingo" (s)	87,43±1,5	87,46±1,4	0,04	6,73<0,001	87,25±1,7	87,24±1,6	0,01	1,83<0,05
3	2 forward jumps, jump with 360 ° rotation (points)	8,45±1,9	8,75±1,7	3,55	4,04<0,05	8,0±2,0	8,2±1,8	2,50	3,42>0,05
4	Connection of aerobic tracks (CAT) (points)	8,65±2,2	8,85±2,1	2,50	3,22<0,01	8,30±2,1	8,50±1,9	2,40	1,05>0,05
Strength qualities									
5	Flexion and extension of the arms in the supine position (number of times) *	27,25±1,9	27,67±1,8	2,4	5,03<0,05	22,63±1,9	22,88±1,9	1,9	4,41<0,01
6	Lifting the torso to the side from a supine position (number of times)	32,91±1,7	33,23±1,5	1,39	4,81<0,05	33,05±1,9	33,23±1,7	0,7	4,43<0,01
7	Holding the "chair" position near the wall (seconds)	97,21±1,5	98,02±1,3	1,04	2,44<0,05	95,56±1,5	96,13±1,5	0,75	1,04<0,05
Speed abilities									
8	Running on the spot for 5 seconds (number of times)	28,87±1,5	29,06±1,3	1,00	1,48<0,05	27,76±1,5	27,96±1,2	1,12	1,16<0,05
9	Raising and lowering straight arms from the position of the main rack, hands down for 10 s (number of times)	22,75±1,9	22,83±1,8	0,62	5,71<0,001	22,23±2,0	22,28±1,9	0,40	3,59>0,001
10	10 leans forward from the main stand, hands up the mountain (seconds)	21,93±1,8	22,05±1,7	0,12	2,02>0,05	22,07±2,0	22,15±1,9	0,08	2,81>0,01
Speed and power qualities									
11	Jumping up from a deep squat for 20 s (number of times)	26,18±1,9	26,26±1,7	0,22	5,19<0,05	26,21±1,5	26,22±1,4	0,07	3,22<0,01
12	Alternate leg swings forward for 20 s not lower than 90 ° (number of times)	32,75±1,8	33,05±1,5	1,31	6,43<0,05	33,15±1,5	33,35±1,5	0,90	4,08<0,001
Flexibility									
13	Bridge (points)	8,98±0,7	9,0±0,5	1,0	3,46<0,01	9,05±0,5	9,13±0,5	0,88	3,11>0,01
14	Twine on the right leg (points)	9,76±0,9	9,96±0,8	2,0	3,59<0,01	9,82±0,7	9,86±0,6	0,4	1,09<0,05
	Twine on the left leg (points)	9,98±0,4	10,00±0,3	0,2	5,51<0,001	9,83±0,5	9,85±0,3	0,2	4,63<0,001
	The twine is transverse (points)	10,00±0,2	10,00±0,2	0,00	6,24>0,001	10±0,2	10±0,2	0,00	5,15<0,001
Functionalities									
15	GSTI (%)*	79,32±1,5	80,43±1,2	1,39	5,7<0,001	78,55±1,7	79,39±1,5	1,08	4,2<0,001

***** ***Note:*** **ID** - initial data (at the beginning of the experiment); **FD** - final data (after the experiment); **GSTI** - Harvard step test index.

Comparison of the dynamics of the results of the two groups indicates an improvement in all indicators of preparedness. The average score by type of training is increasing.

Analysis of the results of technical readiness tests suggests that due to the use of experimental author's model of two-cycle annual training, athletes have reached a higher level in the performance of technical elements of aerobic gymnastics.

Figure 1 shows the changes in the integrated indicator of technical readiness in both groups: MG – 11,5% and CG – 8,8%. It should be noted a significant ($p>0,05$) improvement in the results of technical training of athletes in the main group.



Note: **SPF** - special physical fitness; **TR** - technical readiness; **MG** - main group; **CG** - control group.

Fig. 1. Dynamics of indicators of technical readiness of athletes of the main and control groups

The proposed model of the annual training cycle of athletes 12-14 years old, engaged in aerobic gymnastics at the stage of specialized basic training, leads to the development of individual physical qualities, increasing the level of special training and gaining stability and quality of technical elements of competitive programs.

The training process, which took place according to the proposed model, made it possible to improve the results of athletes' performances at competitions, which

allows us to consider this planning of training work in the annual cycle rational. The training allowed all 12 members of the team - athletes of the experimental group, to meet the standard of a candidate for master of sports of Ukraine in aerobic gymnastics.

Conclusions / Discussion

The results of the study confirm the existing opinion that the problem of improving the training process does not lose relevance [4, 5]. The authors of the works argued the planning of the training process in the annual macrocycle. In our study, the specifics of the training process in aerobic gymnastics as a sport were studied for the first time. Effective means, methods, methodical receptions are revealed and practically substantiated and the size of training loadings is defined. The level of development of physical qualities, special physical training and technical skill of athletes is determined and established. It is experimentally proved and mathematically confirmed that the developed model of the annual training cycle is the most effective for determining the readiness for competitive activities of athletes 12-14 years' old who are engaged in aerobic gymnastics at the stage of specialized basic training.

In the future, further research provides for the development of theoretical and methodological foundations for the construction, improvement and correction of annual training programs for qualified athletes in aerobic gymnastics.

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PECULIARITIES OF THE BALL PASSING BY THE BEST TEAMS OF THE PREMIER LEAGUE AND THE FIRST LEAGUE OF UKRAINE ON FOOTBALL

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Purpose: to determine the performance of ball passing in football teams of different qualifications.

Material and methods: the registration of ball passes was carried out on the example of the best teams of the Premier League: Dynamo Kiev, Shakhtar Donetsk, ZoryaLugansk and the leaders of the First League of Ukraine: VeresRivne, Chornomorets Odessa, Metalist 1925 Kharkiv season 2020/2021. A total of 90 football matches were recorded. To solve the set tasks, the following research methods were used in the work: analysis of scientific and methodological literature, registration of ball passes during the game, methods of mathematical statistics.

Results: the article presents data on the performance of ball passes by the best teams of the Premier and the first Ukrainian football league. The analysis of the effectiveness of the total number of ball passes, forward passes, long passes, passes to the last third of the field, cut passes, and the pace of play of each of the teams was determined.The differences in the use of ball passes by the best teams of the Premier League: Dynamo Kiev, Shakhtar Donetsk, Zorya Lugansk and the leaders of the First League of Ukraine: Veres Rivne, Chornomorets Odessa, Metalist 1925 Kharkiv season 2020/2021.

Conclusions: research data indicate the differences in the use of ball passes by teams of different qualifications of Ukraine on football of the 2020/2021 season.

Thus, it is noted that teams of a higher level have better indicators of the total number of passes and ball passes, and the number of long passes is much lower.

Keywords: passing the ball, tactics, efficiency, pace of the game.

Introduction

Football is a dynamic game that requires a great concentration of players' actions throughout the match. Ball control plays an important role during the game, allowing the team to change the pace and rhythm of a football match [3, 8, 12]. Passing the ball is one of the main components of ball control in football, which combines individual and group tactics.

In addition, Golomazov S., Chirva B., Lysenchuk G., Shamardin V.M. [1, 2, 7] believe that the final result of a football match often depends on the efficiency of transfers in football. In turn, Perevoznyk V., Pertsukhov A. [4, 5, 6] claim that the level of the team primarily depends on the quantitative indicators of one and two touches.

To assess the effectiveness of ball pass in football distinguish [7, 9, 11]:

- distance: short (5-10 m), medium (10-25 m), long (more than 25 m)
- pass in the direction: back, across, forward;
- key passes: in the last third of the field (transfer in the 35-meter zone from the opponent's goal line), cut out pass;
- tempo of the game (number of passes per minute of possession of the ball) [3].

Purpose of the study is to determine the performance of ball passes in football of teams of different qualifications.

Material and Methods of research

The following research methods were used to solve the tasks: analysis of scientific and methodological literature, registration of ball transfers during the game, methods of mathematical statistics. Registration of ball transfers was carried out by recording different types of passes in a specially designed table during the game of the best teams of the Premier League: "Dynamo" Kyiv, "Shakhtar" Donetsk, "Zorya" Luhansk and the leaders of the First League of Ukraine: "Veres" Rivne,

"Chornomorets" Odessa, "Metalist 1925" Kharkiv in the 2020/2021 season. The following indicators were registered in this way: forward passes, long passes, pass to the last third of the field, cuts passes. The pace of play of each of the three best teams of the Premier League and the First League of Ukraine was also determined.

Results of the research

Table 1 shows the performance of the ball during the game by the best teams of the Premier League of Ukraine in the 2020/2021 season. The table shows that the team "Zorya" Lugansk has an advantage in the number of long passes per game 47,8±4,3 times, which is explained by the level of preparation and tactical actions of the team players. "Shakhtar" Donetsk out performs "Dynamo" and "Zorya" in all respects, but the pace of play for "Dynamo" and "Shakhtar" is the same – 17,3±0,4 passes per minute.

Table 1

Performance passes of the ball the best teams of the Premier League of Ukraine in the football season 2020/2021

Teams	Total passes, times	Forward passes, times	Long passes, times	Passes to the last third of the field, times	Cut out passes, times	Tempo of the game, pass/min
"Dynamo" Kyiv (n=15)	488,8±20,3	140,8±18,7	41,2±3,7	58,9±3,8	8,8±0,2	17,3±0,4
"Shakhtar" Donetsk (n=15)	577,9±27,3	155,6±19,8	37,8±2,9	70,1±4,6	10,8±0,3	17,3±0,4
"Zorya" Lugansk (n=15)	397,2±43,4	138,7±19,3	47,8±4,3	53,7±4,3	8,0±0,2	16,1±0,7

Indicators of efficiency (%) of passes by the best teams of the Premier League are presented in Figure 1. Thus, "Shakhtar" team outperforms "Dynamo" and "Zorya" in all respects, only the assists have the same indicators as "Luhansk" – 33 %. "Zorya's" performance is much lower in the last third of the opponent's field and is 69 %, unlike Dynamo's 75% and "Shakhtar's" 83 %.

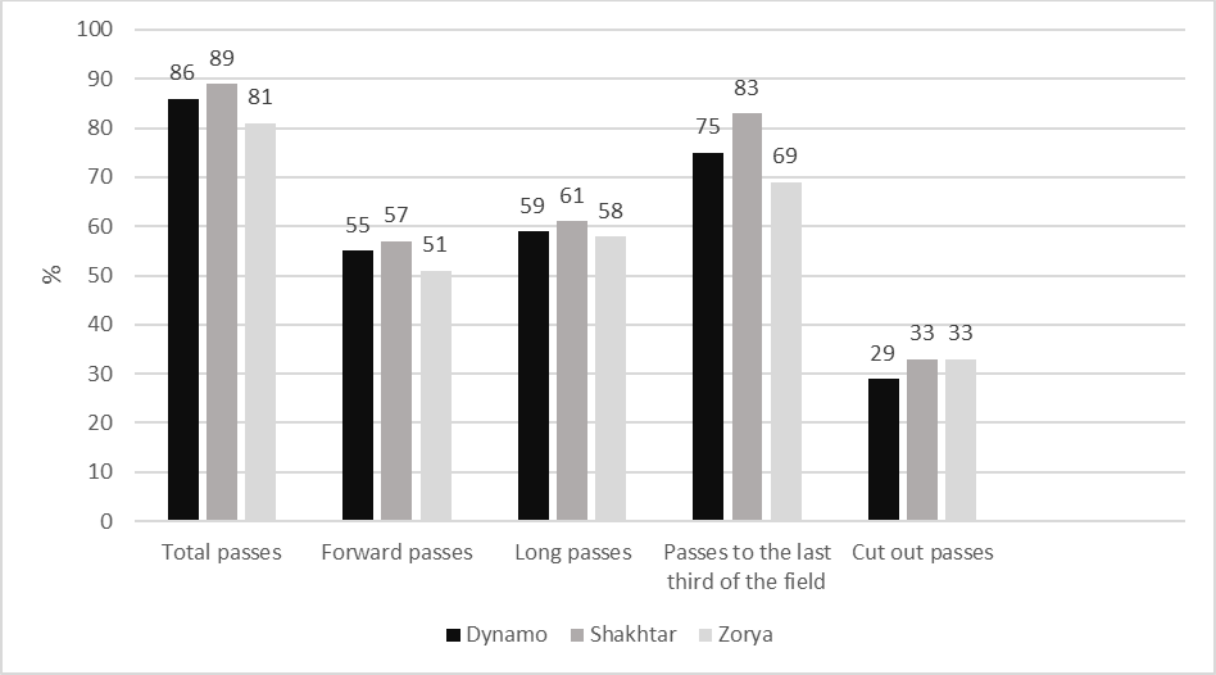

Fig. 1. Efficiency of passing the ball to the best teams of the Premier League of Ukraine in the 2020/2021 season

Analyzing the data in Table 2, we can conclude that the team "Metalist 1925" Kharkiv outperforms the teams "Veres" and "Chornomorets" in terms of total passes - 436±22,7 and forward passes – 147,7±15,7 per game. The team "Veres" Rivne has the best indicators in the number of long passes – 60,6±4,3. "Chornomorets" Odessa has the best indicators in the number of key transfers: in the last third of the field – 60,59±5,4, cut out pass – 9,8±0,3.

Table 2

Performance passes of the ball the First League of Ukraine in the football season 2020/2021

Teams	Total passes, times	Forward passes, times	Long passes, times	Passes to the last third of the field, times	Cut out passes, times	Tempo of the game, pass/min
"Veres" Rivne (n=15)	334,8±38,6	130,1±12,8	60,6±4,3	54,2±7,3	6,6±0,2	15,4±0,5
"Chornomorets" Odessa (n=15)	417,1±28,7	146,1±21,3	50,0±3,7	60,5±5,4	9,8±0,3	16,6±0,3
"Metalist 1925" Kharkiv (n=15)	436,2±22,7	147,7±15,7	50,0±3,1	57,8±4,7	8,6±0,2	16,1±0,4

Indicators of the efficiency of the transfer (%) of the best teams of the First League are presented in Figure 2. Thus, the team "Metalist 1925" outperforms "Veres" and "Chornomorets" in the overall efficiency of the passes (83 %), the team "Chornomorets" has higher performance when performing long passes (67 %) and passes to the last third of the field (67 %) and at "Veres" - passes of a ball in a cut (30 %).

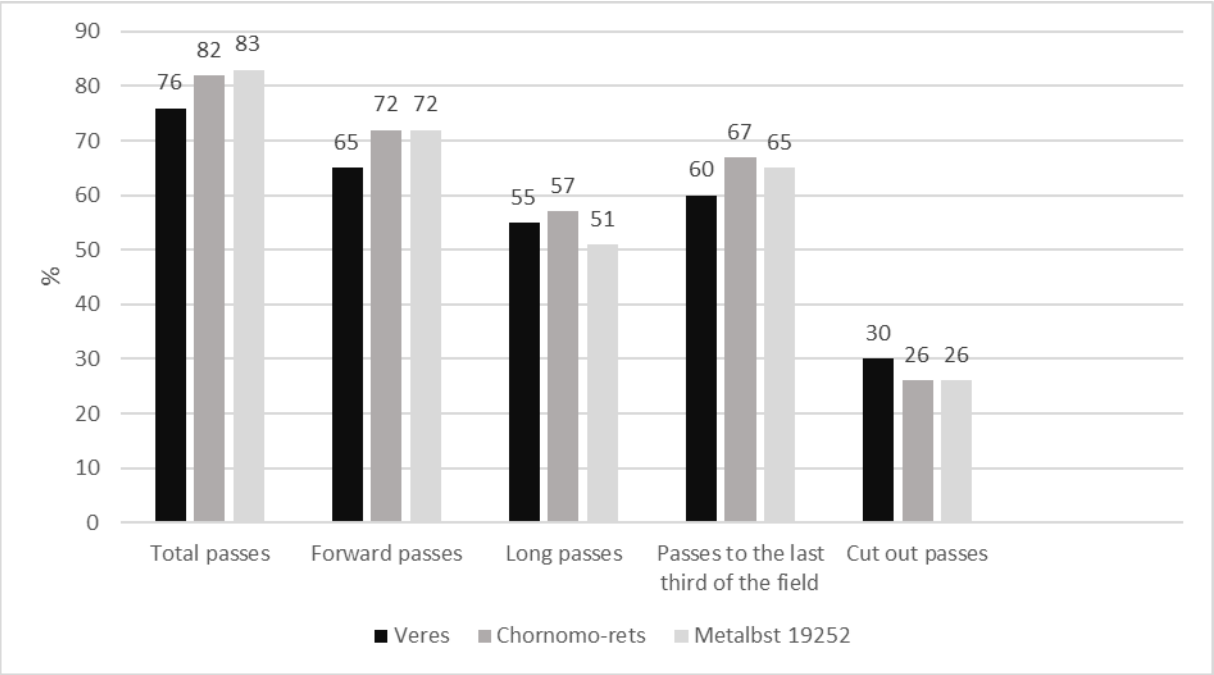

Fig. 2. Efficiency of passing the ball to the best teams of the First League of Ukraine in the 2020/2021 season

Table 3 shows the average performance of the best teams of the Premier League and the First League of Ukraine in the 2020/2021 season.

Comparing the quantitative indicators of the transfer of teams of different qualifications, it was found that the Premier League teams exceed the teams of the First League in terms of the total passes ($t=2,20$; $p<0,05$) and cuts passes ($t=2,01$; $p<0,05$). These differences are explained by the tactical training of both the team as a whole and the skill of the players. Highly skilled teams have more control over the ball, due to the increase in the total number of passes of the ball during the game, and passes in the cut allow you to make attacks much more creative.

Table 3

Indicators passes of ball by the best teams of the Premier League and the First League of Ukraine in the football season 2020/2021

Types of passes	Premier League (n =45)	First League (n =45)	t	p
Total passes,times	487,9±30,3	394,0±22,8	2,20	<0,05
Forward passes, times	145,0±19,3	141,3±16,6	0,14	>0,05
Long passes,times	42,3±3,6	53,5±3,7	2,17	<0,05
Passes to the last third of the field, times	60,9±4,2	53,5±3,7	0,48	>0,05
Cut out passes,times	9,2±0,2	8,3±0,4	2,01	<0,05
Tempo of the game, pass/min	16,9±0,5	16,0±0,4	1,4	>0,05

First League teams have better results in the number of long passes per game ($t=2,17$; $p<0,05$), although these results also confirm the statement that the best teams have more control over the ball due to short and medium passes.

Conclusions / Discussion

The data (Perevoznyk V., Pertsukhov A.) concerning quantitative indicators of performance of transfers of highly qualified teams are confirmed. Supplemented and expanded data (Golomazova S., Chirva B., Lysenchuk G.) on the effectiveness of key ball transfers in football.

The results of the study confirmed the data on the peculiarities of the use of programs by teams of different qualifications. Thus, in this study it is noted that the teams of a higher level have better indicators of the total number of passes and cut out, and the number of long passes is much lower.

For the first time, a comparative analysis of the ball transfers of the best teams of the Premier League and the First Football League of Ukraine was carried out in the research.

Conclusions and main provisions of the study can be taken into account when building the training process of teams of different qualifications.

Prospects for further research. Further research will be devoted to establishing the features of tactical actions in the attack of teams of different qualifications.

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PREVENTION OF SPRING FUNCTION OF THE FOOT, TAKING INTO ACCOUNT THE ANATOMICAL FEATURES OF ITS STRUCTURE

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Purpose: to study the possibilities of expanding conservative methods for correcting the arches of the foot, taking into account the anatomical features of their structure, since in the early stages of acquired deformities of the foot, its pathological setting is usually caused by changes in soft tissues: skin, ligaments and muscles.

Material and methods: 48 male students of KhSAPC, aged 18 to 20, participated in the experimental survey. A survey of representatives of 4 sports specializations was carried out, 12 athletes in each group: Football, Weightlifting, Basketball, Volleyball, Judo, Sambo, Taekwondo. The estimation of the standing height of the longitudinal arch based on the calculation of the "podometric index" (Friedland index). The assessment of the condition of the longitudinal and transverse arches of the foot was carried out by the method of plantometry. The assessment of the metric parameters of the foot was carried out at the beginning of the examination and after teaching the students the methods of manual foot correction: according to the method of muscules relaxation of the feet according to K. Lewit and according to G. Ivanichev. At the same time, autorelaxation of the spasmodic foot and lower leg muscules was carried out using the method of "finger exercises" of impact on the points of painful muscle compaction (BMU) of the plantar and dorsal surfaces of the foot.

Results: there was a change in the arches of the foot of two types (sharp and moderate flat feet) in athletes of the specialization "Football", "Basketball, volleyball", "Judo, sambo, taekwondo", and moderate flat feet in athletes of the "Weightlifting" specialization. Recommendations are given regarding conservative methods for correcting disorders of the foot structure.

Conclusions: the data obtained indicate that with conservative methods of correction of the foot arches, there are positive subjective changes. However, this influence is not enough to maintain the structure of the foot with constant overload. Since athletes have a developed musculo-ligamentous apparatus, which firmly holds the arches of the foot and ensures a tight fit of the foot bones to each other, it is especially important to use conservative methods of correcting the foot arches until the age of 20-25, that is, until the bone growth stops.

Keywords: arches of the foot, spring structures of the foot, flat feet.

Introduction

The study of the anatomical and functional state of the foot is one of the urgent problems of theoretical and practical medicine, as minor structural changes in the foot disrupt the coordinated activity of muscles, bones and joints [1, 4, 12, 13, 17]. In this regard, morphofunctional diagnosis of the condition of the feet and its correction is an essential element in the prevention of a number of disorders of the musculoskeletal system [1, 9]. The complexity of pathological changes is largely due to the anatomical and physiological features of the foot and the variety of its functions.

The ability of the arches of the foot to 80% to dampen the impact energy that occurs at the time of dynamic contact of the foot with the support during walking, as well as especially during jumping and running, determines its spring function. The spring function of the foot protects the joints and bones of the entire human body, including the vertebrae, intervertebral discs and skull bones, from shock overload, and thus from injury. If the spring function of the foot is impaired, it inevitably leads to the rapid development of irreversible diseases of the ankle, knee, hip and intervertebral joints [5, 6, 7].

No less important is the functional action of the foot when pushing off the support (pushing function). The kinetic energy generated by walking, running or jumping is transmitted to the foot at the time of contact of the heel with the support, stored in it during rolling on the sock and again transmitted to the body at the time of separation of the foot from the support. This allows a person to make further translational movement in any direction. In this case, due to the ability of the joints of the foot to move in all planes, a person can maintain a given body posture during movement or in a standing position with any unevenness of support, which allows you to maintain balance (balancing function).

However, abundant innervation and the relationship of the nerve endings of the reflexogenic zones of the foot with various internal organs of the whole body, can affect the entire human body through massage, acupuncture and thermal effects on the feet (reflexogenic function of the feet).

The lifestyle of modern man changes the conditions of functioning of the foot and musculoskeletal system in general. Tolerant attitude to physical activity, which causes obesity and weakening of skeletal muscles, or, conversely, overload of static or dynamic nature can lead to a decrease in the spring capacity of the foot [3, 5].

The foot is the distal part of the lower extremity and can withstand heavy static and dynamic loads throughout life. Individual differences in the structure of the foot are associated with the large number of bones of the foot and the complexity of the joints formed by them, as well as the architecture of the ligament which, in combination with muscles, provides stability and endurance to the foot [6].

The human foot consists of 26 bones, tightly interconnected mainly by immobile joints. The movements of the foot and its parts are carried out by the muscles of the lower leg, the tendons of which pass to the foot, as well as numerous own muscles of the foot. In addition to the muscles in the function of the foot are involved plantar aponeurosis, firmly connected with the skin: - so the skin of the sole is almost motionless. Plantar aponeurosis plays an important role in maintaining the arches of the foot [6].

It is well known that the condition of the arches and feet in general depends on the condition of the ligaments and muscles, as well as on the specific living conditions, work and exercise in which a person is. The evolutionary adaptation of the human foot to the locomotor function affected the uniqueness of its shape, which provided the foot with special properties necessary for upright walking. Biologically, the human foot is designed to walk barefoot on elastic-viscous, uneven natural surfaces: earth, stones, sand. When walking barefoot, the natural soil fills the anatomical depressions of the feet. This supports the receptor and spring function of the foot, which provides stability and steadiness of the lower extremities and the body as a whole on the abutment.

The main feature of the human foot is an arched structure, which forms the arches of the foot, which have a certain shape and relative position of the bones. There are longitudinal and transverse arches in the foot.

Longitudinal arches are formed by arcs extending from the heel hump to the heads of the metatarsal bones.

The most pronounced of them are the lateral vault formed by arcs running along the IV and V metatarsal bones, and the medial vault, the arcs of which run along the I - III metatarsal bones.

The lateral vault carries the bulk of the body and serves as a support when standing, walking or running, and therefore is a bearing, and the medial - spring, because it performs a buffer role.

Transverse vaults:

- the proximal arch is formed by the connection of the metatarsal bones in the form of an arch, and forms an angle of up to 40 ° with the support.

- the distal vault is formed by the heads of the metatarsal bones, and forms an angle of up to 10 ° with the support.

Due to the arches of the foot, the body weight is evenly distributed, and the shock loads from the abutment, while walking or running, are significantly reduced [5, 6].

The shape and size of the arches of the foot in humans can change even during one day under the influence of various static and dynamic loads. When standing, due to some stretching of the ligaments, the foot may be slightly flattened, as evidenced by its elongation by a few millimeters and a slight expansion. A normal foot is one, in which the area of abutment occupies 35-54% of the total area of the foot.

Violation of the anatomical structures of the foot causes flattening of the longitudinal and transverse arches of the foot, which leads to flat feet. There are three degrees of flat feet (Fig. 1):

Fig. 1 Degrees of flat feet:

1st degree - the arches are slightly reduced, but there is no deformation of the foot yet.

2nd degree - the arches are sharply reduced, there is expansion and flattening of the foot.

3rd degree flat feet- no arches, pronounced deformities of the foot.

In contrast to flat feet, an empty foot or a foot with a high rise has deformations in which the distance between the heel hump and the heads of the metatarsals decreases. Thus, the height of the longitudinal arch increases with a simultaneous increase in the curvature of the foot.

It should be noted that with static or dynamic overloads, which are inherent in athletes, the body does not have time to adapt to statokinetic changes in the foot and lower extremities. As a result, the development of flat feet is accompanied by rapid fatigue by the end of the day, pain in various parts of the foot, heel bone, as well as in

the lower leg, thigh and even the lumbar region. Also, one of the common causes of flat feet is the wearing of irrational shoes, because it violates the normal biomechanical conditions of the foot arches.

Purpose of the study: to study the possibility of expanding conservative methods of correction of the arches of the foot, taking into account the anatomical features of their structure.

Material and Methods of research

The experimental survey involved 48 students of KhSAPC aged 18 to 20 years (male). A survey of athletes of 4 sports specializations "Football", "Weightlifting", "Basketball, volleyball", "Judo, sambo, taekwondo" was conducted for 12 athletes in each group.

An estimate of the height of the longitudinal vault based on the calculation of the "podometric index" (Friedland Index). To determine the degree of flat feet, direct podometric features were determined: the height of the arch and the length of the foot, after which the Friedland index was calculated taking into account its gradations proposed by T.A. Globa.

The condition of the longitudinal and transverse arches of the foot was assessed by plantometry. When analyzing the footprint (plantogram), both absolute indicators (foot length, arch height, lifting height, etc.) and relative ones (the value of the foot arch angle, calculated indices) were evaluated. Marking of the plantogram was performed according to the method of Stritter and Chizhin.

Evaluation of metric indicators of the foot was performed at the beginning of the survey and after teaching students the methods of manual correction of the foot.

According to the method of relaxation of the foot muscles according to K. Lewit [11] and G. Ivanichev [2], autorelaxation of the spasmed foot and leg muscles was performed. At the same time, local hypertonia of the leg and foot muscles was determined and their deep massage was performed until relaxation. Direction of movements: on the front surface of the shin and the back of the foot - from top to bottom, on the plantar surface of the foot and the back of the shin - from bottom to top.

The technique of "finger exercises" of influence on painful muscular consolidations of points of a sole and back surface of foot, and multipoint influence on a number of biologically active points of meridians of a body was also used. Additionally, according to the method of V. Janda [10], relaxation of the iliopsoas muscle was performed, which in a state of hypertension maintains and deepens lumbar hyperlordosis.

Manual correction of the foot was of the same type at different degrees of flat feet and was performed every other day for one hour. The total duration of conservative methods of correction of the arches of the foot was 1 month.

Evaluation of the effectiveness of the method of manual correction of the foot in the dynamics was carried out on the most significant indicators: complaints and gait disturbances.

The results are processed using licensed Excel spreadsheet packages and a set of applications. Relative indicators were calculated - the prevalence of the trait and its error. Deviations were considered significant with a difference of relative values of at least 10 %.

Results of the research

Analysis of the results based on the calculation of the "podometric index" showed the athletes of the first group of specialization "Football" the following distribution of the arches of the foot: normal vault was recorded in 8,3 %, very high vault was determined in 41,7 %, moderately high vault – 41,7 %. Sharp flat feet were noted in 8,3 % of the surveyed students.

In athletes of the second group of specialization "Weightlifting" normal arch was recorded in 33,3 %, very high arch in 25 %, moderately high arch in 25 % of subjects. At the same time, 16,7 % of athletes had moderate flat feet, but sharp flat feet in athletes of the second group were not recorded.

Athletes of the third group of specialization "Basketball, volleyball" condition of the arches of the foot is distributed as follows: normal arch is noted in 41.7%, very high arch is defined in 33,3%. Athletes in this group had moderate flat feet in 8,3%, and 16.7% of the surveyed students had severe flat feet.

In the fourth group of athletes specializing in "Judo, sambo, taekwondo" normal arch was noted in 41,7 %, very high arch was recorded in 25 %, moderately high arch in 25% of surveyed students. Sharp flat feet were also recorded in 8,3 % of athletes.

On the basis of plantographic researches the results of a condition change of longitudinal and cross arches of foot are received. Analysis of plantograms showed that athletes of the first group of specialization "Football" have a normal arch in 83.3%, moderate flat feet have 8.3% of students, sharp flat feet are noted in 8,3 %.

Thus, the results of plantography and the conclusions made on the basis of the calculation of the "podometric index" generally coincide. Both anthropometric methods show changes in the arches of the foot in 8,3% of athletes specializing in "Football" (sharp flat feet).

Athletes of the second group of specialization "Weightlifting" have a normal arch in 83,3%, moderate flat feet have 16,7 %, sharp flat feet are not recorded, which is also confirmed by calculations of the Friedland index

The analysis of plantograms of the third group athletes of specialization "Basketball, volleyball" shows a normal arch in 75% of athletes, 25% of the surveyed students have moderate flat feet. Sharp flat feet are not recorded.

Since the results of anthropometric studies (plantometry and pedometry) complement each other and give fairly accurate data on the true state of the foot shape, we can conclude that athletes in the group "Basketball, volleyball" noted changes in the foot arches of two types: sharp flat feet and moderate flat feet.

Analysis of plantograms of athletes of the fourth group of specialization "Judo, sambo, taekwondo" shows a normal arch in 75 % of athletes, moderate flat feet have 8,3%, sharp flat feet were noted in 16,7 % of respondents.

A comparative analysis of the results of podometry and plantometry shows that the athletes of the group "Judo, Sambo, Taekwondo" also have a change in the foot arches of two types: sharp flat feet and moderate flat feet.

It should be noted that before the survey, 83,3 % of athletes complained of fatigue and leg pain during exercise.

After the use of conservative methods of correction of the foot arches, athletes noted positive subjective changes in the muscles and joints of the foot.

Conclusions / Discussion

Analysis of the results of podometry and plantometry shows that athletes in the groups "Judo, Sambo, Taekwondo" and "Basketball, Volleyball" have the greatest deformation of the foot in the form of its flattening compared to the groups "Weightlifting" and "Football".

According to the authors of the literature, the foot accounts for up to 35 % of sports injuries, because in all cyclic, game sports and martial arts the foot plays an important role in achieving sports results [6, 9].

In such sports as basketball, volleyball, football for the effective implementation of vertical and horizontal jumps it is required purposeful development of the explosive force of the muscles of the lower extremities. Thus, the deformation of the foot in the form of its flattening is common in athletes due to high loads on the musculoskeletal and articular ligaments of the lower extremities.

According to the literature, instability of the ligaments of the joints, including the joints of the foot, is often noted during sports. The authors note that when examining fifty athletes, the most common symptoms were pain in the feet (38%), pain in the knee joint (34 %), pain in the lower leg, including chronic sprains (30%) and pain, in the ankle-foot joint (16 %). Of the detected anomalies in the structure of the foot, the most common were varus deformity of the heel bone (in 42 % of cases), displacement of the anterior foot (varus – 24 %, valgus – 14 %), varus deformity of the tibia (12%) and mismatch of leg length in 16% of respondents [15]

In our study, after the use of conservative methods of correction of the foot arches, there were positive subjective changes in the muscles and joints of the foot. Reliable objective results of normalization of the foot arches were not obtained, probably due to the short observation period.

These results coincide with the conclusions of other authors of experimental studies, who claim that conservative methods of correction of the arches of the foot

have positive subjective changes. However, this effect is not enough to preserve the structure of the foot when repeating heavy loads [14].

It should be noted that in our experimental examination of athletes specializing in "Weightlifting" there were complaints not only of fatigue and pain in the legs during exercise, but also pain in the lumbar spine.

It is known that pain in the lumbar spine may be associated with degeneration of the intervertebral discs as important elements of the spinal motor segment [8]. In turn, degenerative changes and damage to the intervertebral discs disrupt the biomechanical function of the spine and can cause pain [16].

As the flattened arches of the foot increase the vertical axial loads on the spine and all its support systems, under the influence of additional load the spine gradually loses the necessary biomechanical orientation, the depth of physiological curves changes and bends in the frontal plane occures- scoliosis.

Due to the presence of such a pathogenetic link, it is advisable to begin the correction of these changes from the foot. A rational way to correct the foot is to restore its arch and systems that strengthen these structures.

Because athletes have a well-developed musculoskeletal system of the foot, which firmly holds the arch and ensures a tight fit of the foot bones to each other, it is especially important to use conservative methods of correction of the foot arch before 20-25 years old, that is, until the cessation of bone growth.

To correct flat feet, it is recommended to avoid wearing narrow shoes, and to minimize the use of shoes with high heels (the optimal height of the heel for foot comfort is 4 cm). It is recommended to avoid regimes of hypokinesia and hyperkinesia and use the whole possible arsenal of rehabilitation effects to increase the functionality of the foot.

Prospects for further research: timely diagnosis of flattening of the foot is a condition for early rehabilitation, which prevents the spread of degenerative processes and the development of destructive changes in the musculoskeletal system. Therefore, there is a need for further scientific and experimental studies of the

anatomical and functional capabilities of the muscular and skeletal system of athletes in specific sports in order to optimally build and correct the training process.

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ANALYSIS OF THE COMPETITIVE ACTIVITY OF TAEKWONDO ATHLETES 12-14 YEARS OLD

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Purpose: to analyze the indicators of competitive activity of taekwondo athletes 12-14 years.

Material and methods: the following research methods were used to solve the tasks: analysis and generalization of scientific and methodological sources and Internet; analysis of protocols and videos of all fights of athletes aged 12-14; methods of mathematical statistics. 117 matches were analyzed, the schedule of which was 2 rounds of 1,5 minutes with a break of 30 seconds in the age group of cadets, during the All-Ukrainian tournament "Children of Ukraine 2020".

Results: from all technical arsenal taekwondo players of 12-14 years most often carry out simple kicks: «bandal chagi» - 61,93%, «dolio chagi» - 13,32 %, «neryo chagi» - 8,18 %, «miro chagi» - 5,80 %, «yop chagi» - 4,58 %, «dzhumok girugi» - 3,91 %. Complex kicks are not performed very often, especially girls. «Twit chagi» boys - 1,26% and girls 0,09 %, «mamdolio chagi» - boys 0,63 % and girls 0,08%, «sambe bandal chagi» - boys 0,19% and girls 0,02% from all kicks. Of the 117 matches analyzed, 92 (78,64 %) of all matches ended in victory in the final. Wins in the additional "golden" round 4 times – 3,43 %. The victory on the difference of points ended 18 matches, which is 15,38 %. Victory according to the referee's preference - 1 time (0,85 %), according to comments - 1 time (0,85 %), due to the termination of the match by the referee (0,85 %).

Conclusions: among the whole arsenal of percussion techniques, simple kicks are most often used, which are performed without revolutions. However, boys use sophisticated technique and punch more often than girls, and girls, in turn, strike more kicks to the head. The more competitive experience an athlete has, the fewer kicks he performs, but their effectiveness is much higher, which is due to the greater number of technical and tactical actions and the expediency of their use at the right time of the fight. Also, athletes try to earn more points and finish the fight early. In order to win a match requires not only technical and tactical training, but also a high level of manifestation of physical qualities, including endurance, which ensures the performance of technical actions without reducing the effectiveness of competitive activities.

Keywords: taekwondo WTF, competitive activity, analysis of competitive activity, cadets 12-14 years old.

Introduction

Today there are many approaches to the analysis of the competitive activity of martial arts, but not many scientists dissect the competitive activity in taekwondo WTF in the kyorugi section, which the most important indicator of physical, technical and tactical skills and psychological lead-up of athletes [1, 5, 12, 13]. So, a high rate of competitive activity in conditions of direct contact with the enemy puts forward new needs for improving the process of training athletes. The effectiveness of taekwondo athlete’s performances at competitions depends on the athlete's ability to perform technical and tactical actions during all fights without reducing their quality. During the fight, the athlete's heart rate reaches 160-180 beats/min, which indicates the manifestation of such a physical quality as endurance. In connection with the changes in the rules, and consequently in the competitive activity, there were significant changes [3, 4, 7, 9].

The branch of competitive activity in taekwondo WTF, at different times, was studied by I. N. Pashkov, A. S. Rovny (2010), A. S. Koscheev (2004), Lukina Elena, Strelchuk Sergey, Gandziarski Krzysztof, Puszczałowska-Lizis Ewa (2019). One of

the latest developments by Vyacheslav Romanenko is the use of computer technology for quick and convenient video analysis of competitive activity using the "Martial Arts Video Analysis" program [8, 9].

There are many methods of studying competitive activity, in particular A.A. Novikov, A.S. Sagaleev, G.S. Tumanyan, using the example of boxing and wrestling, proposed to determine the number of strikes delivered and those that hit the target in order to be able to evaluate the quality of the athlete's competitive activity. Based on the results obtained, it is possible to assess the effectiveness of combat operations [1, 2, 14, 15, 16]. Thus, having determined the coefficients of attacking, defensive actions, competitive activity in a certain weight category, the information obtained allows us to analyze where a particular athlete has an advantage, and where he is inferior to his rivals, and timely adjust the training process to obtain high sports achievements [11, 13, 15, 16].

Connection of work with scientific programs, plans and topics. The study was carried out in accordance with the theme of the research work of the Kharkiv State Academy of Physical Culture: "psycho-sensory regulation of motor activity of athletes in situational sports" (state registration number 0116U008943) and the topic "Scientific and methodological foundations of the use of information technologies in the preparation of specialists in the field of physical culture and sports "(State registration number 0113U001207).

Purpose of the research: to analyze the indicators of the competitive activity of taekwondo athletes 12-14 years old.

Material and Methods of research

The following research methods were used to solve the set tasks: analysis and generalization of scientific and methodological sources and the Internet; analysis of protocols and video recordings of all fights of athletes 12-14 years old, methods of mathematical statistics. 117 fights were analyzed, the regulations of which were 2 rounds of 1.5 minutes with a break of 30 seconds in the age group of cadets, during the All-Ukrainian tournament «Children of Ukraine 2020», which was held in Kharkiv. The number of victories according to the final score, according to the

difference in points, according to preference, according to comments, in the additional round, due to the termination of the match by the referee has been determined; the number of strikes of each type separately. Statistical data were obtained on the coefficients of the effectiveness of attacking actions, defensive actions, competitive activity. Coefficients of variation, variance, arithmetic mean, standard error of arithmetic mean, standard deviation of technical execution of punches and kicks during a fight were analyzed.

Results of the research

The striking technique can be conventionally divided into two parts: simple and complex. Simple technique include the following kicks: bandal chagi, dolyo chagi, neryeo chagi, miro chagi, yop chagi, jumok chirugi. To complex: dwit chagi, mamdolio chagi, sambe bandal chagi.

Table 1

Indicators of the volume of taekwondo players technique, which is used during competitive activity (boys $n_1 = 103$; girls $n_2 = 48$), kicks

		Bandal chagi	Dolyo chagi	Yop chagi	Miro chagi	Dwit chagi	Mamdolio chagi	Sambe bandal chagi	Naeryeo chagi	Jumok chirugi
$\overline{X} \pm$ m	B	33,52± 2,78	6,00± 1,06	3,4± 0,69	3,85± 0,82	2,1± 0,51	1,79± 0,50	1,44± 0,74	5,14± 1,40	4,19± 0,87
	G	31,55± 4,38	9,10± 2,97	4,5± 1,15	4,84± 1,92		1,06± 0,11		6,36± 1,41	2,99± 1,03
σ	B	10,14	3,91	2,47	2,83	1,46	1,11	1,21	3,98	2,68
	G	10,99	6,63	2,99	3,75		0,19		3,68	2,24
σ^2	B	108,62	16,88	9,33	9,46	2,73	1,44	1,91	18,81	8,35
	G	129,57	56,26	14,11	18,21		0,17		17,21	6,10
V(%)	B	30	66	78	73	69	60	60	76	70
	G	34	59	57	75		22		61	68

Having analyzed the obtained data of striking technique at the competitions, the following results were obtained in Table. 1, 2; Fig. 1, 2: so, the bandal chagi is used by the boys 33-45 times per fight and by the girls 31-42 times. The standard deviation is 10,14 and 10,99 beats, respectively. The coefficient of variation is 30% for boys and 34% for girls. Most often, the bandal chagi is used – 61,93%, by the boys – 43,5% and by the girls – 18,88% of the total number of kicks inflicted.

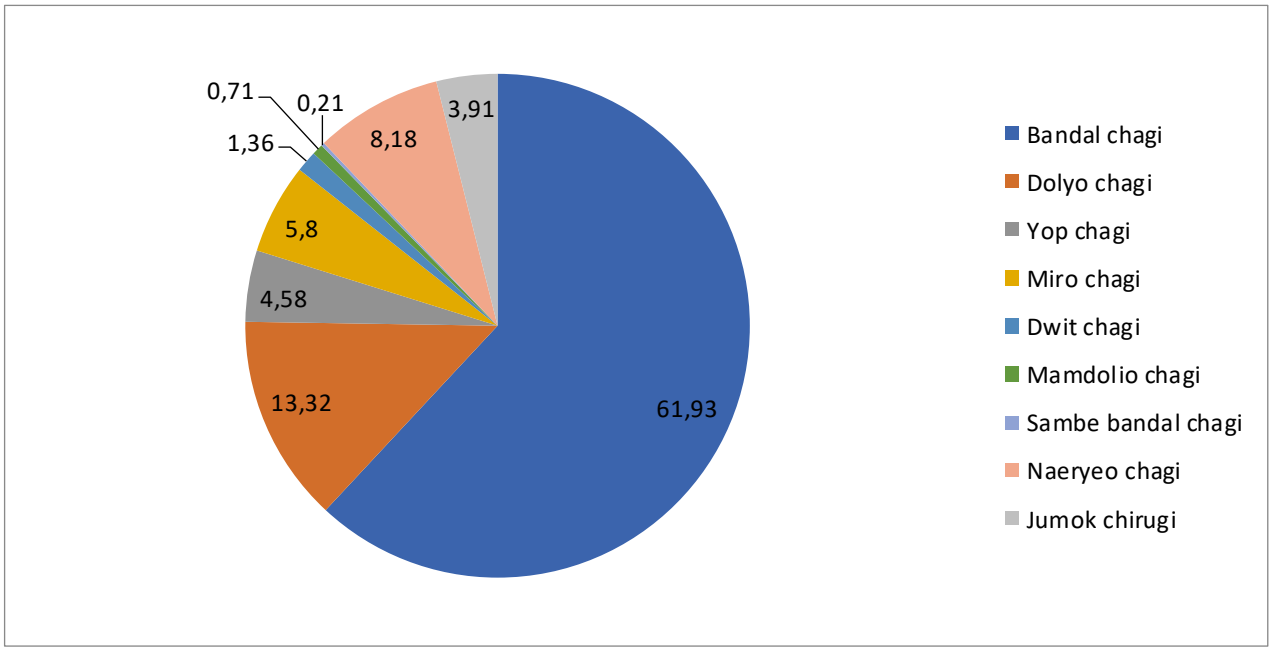

Fig. 1. Use of the volume of equipment during a competitive fight, %

Dolyo chagi is used by boys 6-10 times and by girls 9-19 times. The standard deviation of this stroke is 3,91 for men and 6,63 for women. The coefficient of variation was 66% for boys and 59% for girls. According to the results, the boys use 7,58 % of the total number of kicks, and the girls use 5,74 and in general 13,32 %. Thus, we see that dolyo chagi is performed more often by girls than by boys.

Throughout the fight, the boys perform naeryeo chagi 4-11 times and the girls 6-13 times. The standard deviation is 3,98 beats for boys and 3,68 for girls. The coefficient of variation for boys was 76 % and 61 % for girls, respectively. Naeryeo chagi is used by boys at 5,33 % and girls by 2,85 %. So, this kick is used less often than the previous one. Thus, the overall utilization rate is 8.18%, but the boys use it often – 5,33 %, and the girls only 2,85 % of all striking techniques.

The boys use miro chagi 5-8 times, and the girls 4-10 times during the fight. The standard deviation is 2,83 hits for boys and 3,75 for girls. The coefficient of variation for boys was 73 % and 75% for girls, respectively. Miro chagi use 5.80% of the total number of kicks, but boys more often – 4,04 % than girls – 1,76 %.

During the fight, the boys perform yop chagi 4-8 times and the girls 3-7 times. In terms of standard deviation, yop chagi has 3,91 kicks for boys and 6,63 kicks for girls. The coefficient of variation for boys is 78 %, and for girls it is 57%. In general,

based on the data obtained, yop chagi is used in the amount of 4,58% of all strokes, while the boys are 2,91%, and the girls are 1,67 %.

Jumok chirugi the boys use 4-8 times, and the girls 2-6 times. The standard deviation is 2,68 hits for boys and 2,24 for girls. The coefficient of variation for boys was 70% and 68% for girls. Jumok chirugi, is in great demand among boys 3,21 %, while among girls this figure is only 0,69 %. In general, the punch is used 3,9 1% of all striking techniques.

The boys use the dwit chagi during the fight 2-4 times. The standard deviation is 1,46 and the coefficient of variation is 69. So, the dwit chagi takes 1,36% of all hits, the boys using this kick 1,26%, and the girls only 0,09%.

During the fight, boys perform mamdolio chagi 1-3 times and 1-2 times girls. The standard deviation is 1,11 for boys and 0,19 for girls. The coefficient of variation for boys was 60% and 22% for girls. Mamdolio chagi makes up 0,71% of all kicks inflicted, 0,63% for boys and 0,08% for girls.

Sambe bandal chagi is used by boys 1-2 times. The standard deviation is 1,21. The variation coefficient for the boys was 60%. Sambe bandal chagi makes up 0,21 % of all strikes. For boys, 0,19 % and 0,02 % for girls.

Table 2

Comparison of the use of kicks between boys and girls

		Bandal chagi	Dolyo chagi	Yop chagi	Miro chagi	Dwit chagi	Mamdolio chagi	Sambe bandal chagi	Naeryeo chagi	Jumok chirugi
%	B	43,05	7,58	2,91	4,04	1,26	0,63	0,19	5,33	3,21
	G	18,88	5,74	1,67	1,76	0,09	0,08	0,02	2,85	0,69
Σ%		61,93	13,32	4,58	5,80	1,36	0,71	0,21	8,18	3,91

Complex techniques of strikes with tutning, such as dwit chagi, mamdolio chagi and sambe bandal chagi, are used very rarely, but boys, despite the complexity of execution, use them more often than girls.

So, after analyzing the data obtained on the use of the volume of kicks, we can say that the boys perform more diverse and complex techniques in fights and hit with the hand much more often, and the girls give more preference to simple techniques, but at the same time the number of kicks to the head is greater.

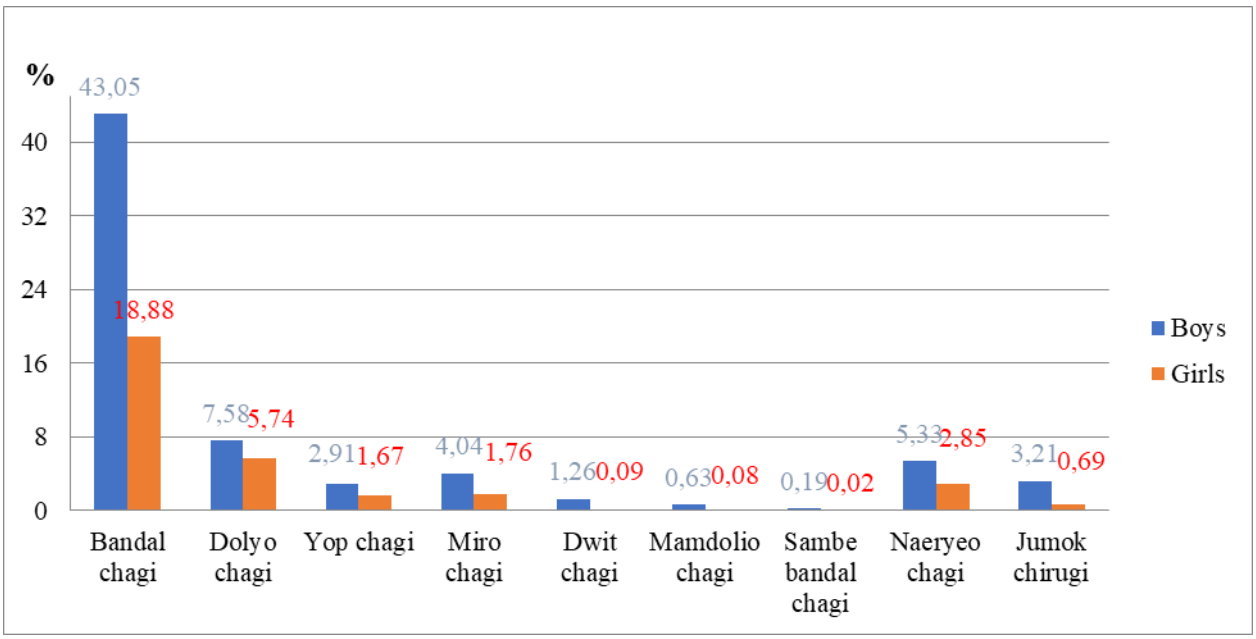

Fig. 2. Comparison of the use of punches by boys and girls, (%)

After analyzing the coefficients of the effectiveness of the competitive activity of taekwondo players, the following results were obtained in Table 3: the number of kicks delivered for the boys is 48,48±3,42, and for the girls 57,15±8,56 punches. The standard error for the boys is 13,09, and for the girls 12,91 strokes. At the same time, the samples of boys - 32% and girls - 25% are not stable in their indicators. This suggests that in each fight the number of strikes is different due to the fact that the opponents have different sports qualifications.

Table 3

Coefficients of the effectiveness of the competitive activity of taekwondo athletes

Index	Gender	CS	CEAA	CEDA	CECA	Density of the fight
$\overline{X} \pm m$	Boys	48,48±3,42	0,27±0,07	0,79±0,05	1,08±0,03	0,58±0,03
	Girls	57,15±8,56	0,26±0,09	0,85±0,07	1,11±0,08	0,64±0,03
σ	Boys	13,09	0,15	0,13	0,08	0,12
	Girls	12,91	0,14	0,10	0,13	0,09
σ^2	Boys	187,93	0,03	0,02	0,01	0,02
	Girls	185,75	0,03	0,01	0,03	0,01
V(%)	Boys	32	54	17	7	20
	Girls	25	59	12	12	16

Note: CS – coefficient of strikes; CEAA – coefficient of effectiveness of attacking actions; CEDA – coefficient of effectiveness of defensive actions; CECA – coefficient of effectiveness of competitive actions

The coefficient of effectiveness of defensive actions reflects the number of the opponent's kicks that were reflected. When analyzing the data, the following results

were obtained: for boys, the arithmetic mean is 0,79±0,05, and for girls, 0,85±0,07 strokes. The standard error is 0,13 for boys and 0,10 for girls, indicating a small deviation from the arithmetic mean. The coefficient of variation is 17 and 12 %, which means they have an average run-up between the indicators.

The coefficient of the effectiveness of competitive actions indicates how effective the attacking and defensive actions were during the fight. The arithmetic mean value for boys is1,08±0,03 and 1,11±0,08 for girls. The standard error for boys is 0,08 and for girls 0,13. The coefficient of variation for boys is 7 %, which indicates the stability of the indicators of the general population and 12 % for girls, where the stability of indicators is average.

The density of the fight reflects the time of the fight that was spent by the athlete directly on the performance of attacking or defensive actions. In these competitions, the sum of the time of two rounds is 3 minutes. So, this coefficient for boys was 0,58±0,03 and 0,64±0,03 for girls. The standard error for boys is 0,12 and 0,09 for girls. The coefficient of variation was 20 % and 16 %, respectively, which indicates the average stability of the indicators.

Table 4

Qualitative indicator of victories in fights

	Decisions	Number of fights	%	Total fights
1	Win by final score	92	78,64	117
2	Win by point gap	18	15,38	
3	Win by superiority	1	0,85	
4	Win by referee`s punitive declaration	1	0,85	
5	Win by Golden Point	4	3,43	
6	Win by Referee stops Contest	1	0,85	

Analyzing the obtained data of victories in fights, the following table results were obtained. 4: 92 fights win by final score, which is 78,64% of the total number of fights. The win by the point gap, ended 18 fights, which is 15,38%. Only one fight ended with a win by superiority, which is 0,85% of all. The win by Golden Point ended 4 times, which amounted to 3,43%. There was also only one victory by

referee`s punitive declaration – 0,85 %. The victory by Referee stops Contest has one case and which is 0,85 % of all matches.

Conclusions / Discussion

1. Among the entire arsenal of striking techniques, simple strikes are most often used, which are performed without revolutions. However, the boys use a complex technique and punch with a higher frequency than the girls, and the girls, in turn, strike more to the head.

2. The more competitive experience a sportsman has, the fewer strikes he performs, however, their effectiveness is much higher, which is due to the large number of technical and tactical actions and the expediency of their use at the necessary moment of the fight. Also, athletes try to earn more points and finish the fight ahead of schedule.

3. In order to win a duel, not only technical and tactical training is necessary, but also a high level of physical qualities manifestation, in particular endurance, which ensures the implementation of technical actions without reducing the effectiveness of competitive activity.

4. Of all the fights analyzed, 78% wins by final score, which indicates that the competition in weight categories is quite high and the sports experience and qualifications of athletes are approximately the same.

Prospects for further research in this direction will be aimed at analyzing WTF taekwondo fights by rounds and identifying the dynamics of density changes during the rounds, which will reveal the mechanisms that affect the victory, taking into account the manifestation of the athlete's endurance and provide information on improving the effectiveness of the competitive activity of taekwondo athletes 12-14 years.

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DYNAMICS OF INDICATORS OF COORDINATION ABILITIES OF BASKETBALL PLAYERS OF PRIMARY TRAINING GROUPS UNDER THE INFLUENCE OF USING SPECIAL PREPARATORY EXERCISES

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Purpose: to determine the degree of influence of special preparatory exercises on indicators of coordination abilities of basketball players of initial preparation groups.

Material and methods: the study involved 40 athletes aged 9 - 11 years, that are part of initial training groups of the second year of study in the sports school № 7 in Kharkiv (control group 20 athletes, experimental group 20 athletes). To establish the indicators of coordination readiness of young basketball players, the standard test exercises proposed by L.P. Sergienko [13] were used.

Results: in the training process of the experimental group of special - preparatory exercises were used: various jumps and acrobatic exercises, as well as sets of exercises on a trampoline. This technique had a positive effect on the coordination abilities of basketball players in the initial training group, and significant differences were found between the results before and after the pedagogical experiment ($p<0,05$).

Conclusions: the positive dynamics of coordination abilities indicators of the experimental group is established after the pedagogical experiment. Thus, in testing the control of evaluation and regulation of spatio-temporal and dynamic parameters

of movements, the improvement of results in percentage was from 9 % to 43 %, in testing the evaluation of sense of time the increase in results ranged from 27% to 56%, improvement of muscle accuracy efforts ranged from 3 % to 16 %, the dynamics of indicators of control of spatial orientation was from 7 % to 43 %, the results of control of stability of static and dynamic balance after the pedagogical experiment improved from 14% to 18%, indicators of sense of rhythm changed by 7 %, indicators of control of the ability to arbitrarily relax muscles improved by 3 %, the results of control of coordination of movements were increased by 31 % ($p>0,05$).

Keywords: basketball athletes, coordination abilities, specially selected sets of acrobatic exercises, trampoline exercises.

Introduction

The deterioration of the performance of Ukrainian basketball players at competitions of various levels has recently become stable. Yes, eight years ago, the Ukrainian masters of the orange ball were among the Top 6 best teams in Europe. In the 2020 season, the best result of the men's team was only entering the Top 16 teams of the European Cup.

Many experts express their opinion on this issue. According to L. Poplavsky, the rapid deterioration of results is due to errors in team management during the competition and its staffing [8].

The results of research [5] indicate a general low level of sports and pedagogical staff of the industry, and, as a consequence, shortcomings in the preparation of sports reserves.

A. Timofeev notes that this situation is related to the problems of financing children's and youth sports [1].

However, in our opinion, the main issue is the involvement of the most talented young men and women, physically developed, with sufficient anthropometric data to play basketball [11-14].

In the system of physical training of young basketball players a special place belongs to the development and improvement of coordination skills [6-9]. Developed

coordination skills allow young athletes to learn better, more accurately assess the spatial, temporal, dynamic parameters of their movements, accurately and quickly perform motor actions in unusual conditions, navigate in time and space, even anticipate changes in motor actions, perform movements efficiently and effectively [7].

Sufficient attention has been paid to the problem of studying and improving the coordination abilities of different contingents of people in the scientific and scientific-methodical literature.

In the theory and methods of physical education in-depth study of the development and improvement of coordination skills of different contingents of children engaged Krutsevich T. (2005), Lyakh V. (2006), Bala T. (2015).

In sports games the work of Gorchanyuk Y. (2016), Moiseenko O. (2018), covered this issue in terms of improving certain functions of analytical systems.

Research Nesson O. (2017) experimentally confirmed the positive dynamics of the development of coordination skills after the introduction of complex coordination exercises in the educational and training process of handball in 13-14 years.

According to the results of research [6], the author considered the role of coordination skills in the system of training qualified basketball players. The paper proved their influence on the performance of athletes in competitions of different levels.

Pomeshchikova I., Chucha N., Pashchenko N. dealt with the problem of improving different types of coordination of young basketball players. [7 - 9].

Despite the fact that many problems were devoted to the problem of development and improvement of coordination abilities of young basketball players, many issues are open and need further consideration.

Therefore, the **purpose** of our research was to determine the degree of influence of special - preparatory exercises on the indicators of coordination abilities of basketball players of initial training groups.

Material and Methods of research

The following research methods were used in the work: theoretical analysis and generalization of scientific and methodical literature, study of documentary materials and pedagogical observation, pedagogical testing, pedagogical experiment, methods of mathematical statistics.

The following test exercises proposed by Sergienko L. were included in the pedagogical testing. Testing of coordination abilities took place according to the indicators: shuttle run from 3x10 m with running around stuffed balls (s), shuttle run 4x9 m with a basketball (s), jumping on the marking (cm), passing the basketball on speed and accuracy (s), a test to assess the ballistic coordination of movements, running errors on the spot at an average pace of 5 and 10 s, the maximum wrist dynamometry of the right and left hand, and the differentiation of muscular effort 50% of the maximum (kg), throws the ball into the target, standing with his back (points), estimates of spatial accuracy movements, in the shoulder and hip joints 45^0 and 90^0, static balance according to the method of Bondarevsky (c), dynamic balance when performing turns on a gymnastic bench (c), sprint in a given rhythm (c), the ability to arbitrarily relax muscles (points) , comprehensive control of coordination of movements, evaluation of test results "ten eights".

The study involved 40 athletes aged 9 to 11 years. Among them there were 20 boys-basketball players studying in groups of initial preparation of the second year of training in sports school № 7 of the city of Kharkiv which were a part of the control group, and 20 boys-basketball players studying in groups of initial preparation of the second year of training of sports school № 7 of the city of Kharkiv who were a part of the experimental group. Athletes who participated in the study had the consent of their parents and studied with different coaches - teachers.

Results of the research

For four months, the training process of the experimental group was supplemented with a set of special exercises in acrobatics, modified moving games and specially selected exercises on the trampoline.

During the pedagogical experiment, the young athletes gradually increased the load: increased the dosage, complexity and speed of exercise.

Specially selected load varied taking into account the age, physical fitness and individual characteristics of the athletes involved. Special exercises were included in the preparatory, main and final parts of the lesson, which are presented in table 1.

Table 1

Additional educational material for conducting a pedagogical experiment

№	Content of educational material	Load	Distribution of educational material within the annual macrocycl
1.	**Acrobatic exercises.** Grouping, racks on the shoulders, forearms and arms, rolls forward, backward. Wheel coup. "Bridge". Varieties of basketball falls, which were combined with the above and simulation exercises.	Small	General preparatory stage
2.	**Jumping exercises.** Jumps from different starting positions, moving forward, with turns. Varieties of jumping using a gymnastic bridge. Jumping exercises with tasks (asymmetrical work of arms and legs).	Great	General preparatory stage
3.	**Exercises using a gymnastic trampoline.** Walking, classes of different starting positions and their combination, small jumps along the entire plane of the trampoline, pace jumps with a gradual increase in takeoff height, after performing different height jumps on the task. Complexes of the above exercises.	Average	General preparatory stage
4.	**Modified mobile games.** Modified mobile games and relays	Average	General preparatory stage

During 4 months, the training process of the experimental group was supplemented by specially selected exercises aimed at developing different types of coordination. The process of physical training was complicated by various jumping movements, overturns, racks, which were performed both in the main and reverse, as well as various exercises on the trampoline. The selection of educational material was aimed at the accumulation of motor skills and the development of the ability to master, and the variable application of game techniques. Exercises on the trampoline led to the development of special jumping skills. The training microcycle of the experimental group is presented in table 2.

Table 2

Training weekly cycle of classes for groups of initial preparation of the second year of study at the general preparatory stage

Day	№ Class	The predominant focus	Dosage (min.)	Load
Mon.	**1**	Improving individual technical skills, types of gears. Development of special flexibility, acrobatic exercises. Moving game	90	Small
Wed.	**2**	Improving speed - strength and special dexterity, exercises on a gymnastic trampoline.	90	Average
Mon.	**3**	Improving individual technical skills, types of throws. Development of special flexibility, acrobatic exercises. Moving game.	90	Small
Sat.	**4**	Improving individual technical skills, types of gears. Development of speed - strength qualities, jumping exercises. Relay.	90	Average

.The results of testing the coordination abilities of the basketball players of the experimental and control groups after the introduction of special training exercises in the training process are presented in table 3.

Table 3

Indicators of coordination abilities of basketball players of control and experimental groups after carrying out pedagogical experiment (n = 40)

Motor tests	CG after the experiment (n = 20)	EG after the experiment (n = 20)	t	p
	$\overline{X} \pm m$			
Control of the ability to assess and regulate the spatial - temporal and dynamic parameters of movements				
Shuttle run 3x10 m with running of stuffed balls (s)	9,71±0,42	9,31±0,62	0,53	>0,05
Shuttle run 4x9.14 m with basketball (s)	20,01±1,36	18,47±0,85	0,96	>0,05
Marking jumps (cm)	9,21±0,91	6,71±0,81	2,08	<0,05
Basketball transfer ball speed and accuracy (s)	29,41±2,11	26,43±1,01	1,27	>0,05
Test to assess ballistic coordination of movements (cm)	1,01±0,43	2,26±0,42	2,08	<0,05

continuation of table 3

Evaluation of the sense of time				
Error running on the spot at a medium pace (5 s)	1,41±0,42	0,92±0,51	0,74	>0,05
Error running on the spot at a medium pace (10 s)	1,76±0,51	1,43±0,45	0,49	>0,05
Estimation of accuracy of muscular efforts				
Error reproducing maximum effort (100% of maximum), right hand (kg)	5,76±1,72	5,54±1,43	0,10	>0,05
Error reproducing maximum effort (100% of maximum) left hand (kg)	4,43±1,02	4,23±1,51	0,11	>0,05
Error reproducing maximum effort (50% of maximum) right hand (kg)	3,52±1,21	3,13±1,02	0,25	>0,05
Error reproducing maximum effort (50% of maximum) left hand (kg)	3,16±0,91	3,24±1,62	0,04	>0,05
Control of spatial orientation abilities				
Throws the ball into the goal, standing with his back to it (points)	7,74±1,33	8,46±0,92	0,45	>0,05
Error reproducing angular movements in the shoulder joints (45°)	8,51±0,92	5,12±1,21	2,23	<0,05
Error reproducing angular movements in the shoulder joints (90°)	8,11±1,12	4,91±0,92	2,21	<0,05
Error reproducing angular movements in the hip joints (45°)	7,45±1,34	6,76±1,73	0,32	>0,05
Error reproducing angular movements in the hip joints (90°)	9,43±1,12	9,04±1,73	0,19	>0,05
Equilibrium stability control (static and dynamic)				
Static equilibrium according to the method of Bondarevsky (with open eyes) (s)	22,47±2,01	30,84±2,13	2,86	<0,01
Dynamic balance when performing turns on a gymnastic bench (s)	9,78±1,12	7,14±0,62	2,08	<0,05
Rhythm control				
Sprint difference in a given rhythm (s)	1,64±0,72	1,45±0,43	0,23	>0,05
Indicators of the ability to arbitrarily relax muscles				
Ability to relax muscles arbitrarily (points)	3,71±0,33	3,91±0,21	0,51	>0,05
Control of coordination of movements				
Comprehensive control of coordination of movements, evaluation of test results "ten eights"	14,34±1,83	11,34 ±1,41	1,30	>0,05

The results of coordination abilities of control and experimental groups after pedagogical experiment in testing control of ability to assess and regulate spatio-temporal and dynamic parameters of movements, jumps on marking and test for assessment of ballistic coordination of movements reproduction of angular movements in the shoulder joints (90°), indicators of static and dynamic equilibrium

found significant differences between the results of the two groups, and these differences are significant and statistically significant ($p < 0,05$) (table 3).

There were no significant differences between the test results of other indicators ($p > 0,05$).

Conclusions / Discussion

Analyzing the dynamics of the coordination abilities of the control and experimental groups after the pedagogical experiment, it was found that they improved, and amounted to the following: at 9 % ($t=0,53$; $p>0,05$); in the results of testing the 4x9m shuttle run with a basketball (s), changes were found by 15 % in the control group and by 24 % in the experimental group ($t=0,96$; $p>0,05$); the indicators of marking jumps changed in the direction of improvement in percentage - in the control group by 3 %, in the experimental group by 43 % ($t=2,08$; $p<0,05$); changes in the results of passing the basketball on speed and accuracy were recorded at the mark - in the control group 14 %, in the experimental group by 18 % ($t=1,27$; $p>0,05$); comparing the testing of the assessment of ballistic coordination of movements, a double prevalence of the indicators of the experimental group over the results of the control; the results of on-site running testing at an average pace of 5 s - in the control group changed by 22 %, in the experimental group by 56% ($t=2,08$; $p<0,05$); the dynamics of running on the spot at an average pace of 10 s, was similar - in the control group there were changes by 18 %, in the experimental by 27 % ($t=0,74$; $p>0,05$); changes in the error of reproduction of the maximum force (100 % of the maximum) of the right hand after the experiment - in the control group set 3 %, in the experimental result was repeated, and also set 3 % ($t=0,10$; $p>0,05$); the dynamics of the error of reproduction of the maximum force (100 % of the maximum) of the left hand - in the control group was – 2 %, in the experimental – 5 % ($t=0,11$; $p>0,05$); changes the error of reproduction of the maximum effort (50 % of the maximum) of the right

The analysis of indicators of control of abilities of orientation in space on indicators of throws of a ball in the purpose, standing with its back, shows that in control group they made 4 %, in experimental 15 % ($t=0,45$; $p>0,05$); in the

reproduction of angular movements in the shoulder joints (450) the error decreased - in the control group by 8 %, in the experimental group by 42 % ($t=2,23$; $p<0,05$); a similar trend was observed in the testing of the error of reproduction of angular movements in the shoulder joints (90°), so in the control group these changes were 16%, in the experimental 43 % ($t=2,21$; $p<0,05$); reproduction of angular movements in the hip joints (45°) test participants managed to improve, in the control group by 9%, in the experimental group – by 13 % ($t=0,32$; $p>0,05$); when reproducing angular movements in the hip joints (90°) the error decreased - in the control group by 5%, in the experimental group by 7 % ($t=0,19$; $p>0,05$); improvement of static equilibrium according to the method of Bondarevsky – in the control group was 6%, in the experimental 14% ($t=2,86$; $p<0,01$); dynamic equilibrium when performing turns on the gymnastic bench changed - in the control group by 4 %, in the experimental group by 18% ($t=2,08$; $p<0,05$); changes in sprint parameters in a given rhythm were found - in the control group 6%, in the experimental group 7 % ($t=0,23$; $p>0,05$); the ability to arbitrarily relax the muscles improved - in the control and experimental groups by 3 % ($t=0,51$; $p>0,05$); the results of the control of coordination of movements, according to the evaluation of the test "ten eights" improved in the control group by 14%, in the experimental group by 31 % ($t=1,30$; $p>0,05$).

Analysis of literature sources shows that this problem is not new. The introduction of specially selected sets of exercises on the coordination ladder into the educational and training process of beginners helped both to improve the indicators of coordination abilities and indirectly influenced the results of physical fitness of students - athletes [4].

According to the results obtained by Bykova O. O., complexes of specially selected exercises, the indicators of coordination of handball players of basic training groups were improved [3].

Thus, the analysis of statistical material found that the studied indicators of control of the ability to assess and regulate spatio-temporal and dynamic parameters of movement, the ability to orient in space, stability of static and dynamic balance, control of rhythm, ability to arbitrarily relax muscles and control coordination

movements after the introduction of complex exercises in the educational and training process of young basketball players with a difficult coordination orientation have improved, and according to the indicators of marking jumps, ballistic coordination test, errors of reproduction of angular movements in shoulder joints (450 and 900), the results of the experimental group prevail such control.

Comparing the indicators obtained after the pedagogical experiment with the results of Sergienko L. their improvement is established.

Prospects for further research. In the future in this direction it is interesting to determine the impact of a system of special complex coordination exercises on the indicators of physical fitness of young basketball players.

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COMPARATIVE CHARACTERISTICS OF TTA OF THE WORLD'S LEADING FOOTBALL CLUBS

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Purpose: to determine model indicators of performing technical and tactical actions by high-level teams.

Material and methods: registration of technical and tactical actions was carried out on the example of games of participating teams in the 2020/2021 UEFA Champions League. A total of 242138 technical and tactical actions in 25 games of the teams «Manchester City» (Manchester, England), «Chelsea» (London, England), «Olympique» (Marseille, France), «Olympiacos» (Piraeus, Greece), «Porto» (Porto, Portugal), «Krasnodar» (Krasnodar, Russia), «Rennes» (Rennes, France), «Sevilla» (Sevilla, Spain), «Atletico» (Madrid, Spain), «Borussia» (Dortmund, Germany), «Borussia» (Monchengladbach, Germany), «Real» (Madrid, Spain), «Paris Saint-Germain» (Paris, France) were registered and analyzed. The following research methods were used to solve the tasks: analysis of scientific and methodological literature, registration of technical and tactical actions, methods of mathematical statistics.

Results: the article presents data characterizing features of the defensive and attacking TTA by high level teams based on the results of the 2020/2021 UEFA Champions League games. Model indicators of making the ball passes (different in purpose, distance, direction, trajectory, method of performance), shots on target (with

a foot and head from different areas of the football field), dribbling of an opponent, aerial duels, tackles, interceptions, knocking out the ball, blocking strikes into the goal have been developed.

Conclusions: the data of the study show differences in the structure of competitive activity of different level teams in the games of the 2020/2021 UEFA Champions League. The winning team outnumbered their rivals in almost every indicator.

Keywords: football players, model indicators, TTA, passes, shots, interceptions, tackles attempted.

Introduction

It is known that the management of football players should be based on the use of models [6, 12, 13, 22, 27, 29]. In this case, there are several definitions of the term «model», but all authors define it as a certain sample, standard, standard or benchmark [5, 6, 22, 24].

The study of literature sources allowed us to establish that for the evaluation of certain models by experts using model characteristics [1, 8] and model indicators [5, 6].

Model characteristics are considered as [1, 8, 22]:

- ideal characteristics of the athlete's condition, in which he can show record results;

- indicators (tests), increasing the results of which leads to an increase in competitive achievements;

- some indicators that are part of the model.

In turn, the model indicators of football players are divided into model indicators of sports opportunities, sportsmanship and competitive activity [6].

Thus, model indicators of sports opportunities include indicators that reflect the morphological and functional features of the body of athletes. Currently, a study of morphofunctional features of the player, namely:

- age of players of different roles [14];

- overall body dimensions of football players of different levels and roles [2, 3, 9, 16, 23, 30];

- functional training of football players of different qualifications [5, 15, 25, 32, 36, 34].

Model indicators of sportsmanship are based on the level of different aspects of football players training:

- physical [6, 24, 31];

- technical [7];

- tactical [17, 19].

Model indicators of competitive activity of football players are developed following the results of control of their competitive activity which is carried out in two directions:

- registration of motor activity [20, 26, 28, 33];

- registration of technical and tactical indicators [8, 10, 17, 18, 24].

The analysis of the available literature allowed to study and generalize the information concerning development of models of competitive activity of three levels:

- generalized models [4, 37];

- group models [17, 35];

- individual models [11, 21].

Purpose is to determine model indicators of performing technical and tactical actions by high-level teams.

Material and Methods of research

The following research methods were used to solve the tasks: analysis of scientific and methodological literature, registration of technical and tactical actions, methods of mathematical statistics. Registration of technical and tactical actions was carried out on the example of games of participating teams in the 2020/2021 UEFA Champions League. A total of 25 games of the teams «Manchester City» (Manchester, England), «Chelsea» (London, England), «Olympique» (Marseille, France), «Olympiacos» (Piraeus, Greece), «Porto» (Porto, Portugal), «Krasnodar»

(Krasnodar, Russia), «Rennes» (Rennes, France), «Sevilla» (Sevilla, Spain), «Atletico» (Madrid, Spain), «Borussia» (Dortmund, Germany), «Borussia» (Monchengladbach, Germany), «Real» (Madrid, Spain), «Paris Saint-Germain» (Paris, France) were registered and analyzed. The teams participating in this tournament registered the following TTA: aerial duels, tackles attempted, interceptions, clearances, blocks, shots, dribbles, short and long passes, crosses, through ball and key passes.

Results of the research

Table 1 shows the average quantitative indicators of the team TTA of the team «Manchester City» (finalist of the UEFA Champions League season 2020/2021) and its rival teams.

Table 1

Quantitative indicators of the TTA of the team «Manchester City» (Manchester, England) in the games of the UEFA Champions League season 2020/2021 (n=13)

Technical and tactical actions	**Team «MC»**		**Rival teams**		t	p
	X_1	m_1	X_2	m_2		
• *Touches*	859,1	21,4	599,2	19,4	**9,00**	**<0,001**
• *Passes*	684,5	27,9	442,9	25,1	**6,44**	**<0,001**
• *Dribbles*	22,6	2,0	15,0	1,4	**3,11**	**<0,01**
• *Shots*	13,0	1,4	6,5	1,0	**3,78**	**<0,001**
• *Aerial duels*	18,8	2,6	18,8	2,6	0,00	>0,05
• *Tackles attempted*	22,6	1,5	29,8	1,9	**2,97**	**<0,01**
• *Interceptions*	9,0	1,1	10,5	1,2	0,92	>0,05
• *Clearances*	10,2	1,4	18,6	2,6	**2,84**	**<0,01**
Blocked shots	2,0	0,7	3,3	0,6	1,41	>0,05
Blocked crosses	8,0	0,7	8,2	0,7	0,20	>0,05

The table shows that the players of the team «Manchester City» in the games of this tournament significantly outperformed their opponents in the quantity of touches to the ball (t=9,00; p<0,001), passes (t=6,44; p<0,001), dribbles of the opponent (t=3,11; p<0,01) and shots on goal (t=3,78; p<0,001). In turn, Manchester City's opponents outperformed them in the quantity of tackles attempted (t=2,97; p<0,01) and clearances (t=2,84; p<0,01).

Table 2 shows the average quantitative indicators of the TTA of the team «Chelsea» (winner of the UEFA Champions League season 2020/2021) and its rival teams.

Table 2

Quantities of TTA of the team «Chelsea» (London, England) in the UEFA Champions League games of the 2020/2021 season (n=13)

Technical and tactical actions	Team «Chelsea»		Rival teams		t	p
	X_1	m_1	X_2	m_2		
• *Touches*	720,5	31,4	671,6	32,6	1,08	>0,05
• *Passes*	535,5	32,2	488,3	33,4	1,02	>0,05
• *Dribbles*	18,0	1,9	18,5	2,4	0,16	>0,05
• *Shots*	11,2	1,1	9,3	1,0	1,28	>0,05
• *Aerial duels*	31,2	2,2	31,2	2,2	0,00	>0,05
• *Tackles attempted*	24,2	2,3	24,8	2,2	0,19	>0,05
• *Interceptions*	11,2	1,1	10,5	1,0	0,47	>0,05
• *Clearances*	18,2	2,0	13,1	2,0	1,80	>0,05
Blocked shots	3,2	0,6	2,6	0,5	0,77	>0,05
Blocked crosses	10,5	1,0	8,2	0,7	1,88	>0,05

The results of the table show that no significant differences in the quantity of TTA teams of the team «Chelsea» and rival teams were found.

As a result of a comparative analysis of the competitive activity of the Champions League finalists 2020/2021 in the games of this tournament, it was found (Table 3) that the attacking TTA was dominated by players of the team «Manchester City», and the defensive TTA – players of the team «Chelsea».

Table 3

Quantitative indicators of TTA teams «Manchester City» (Manchester, England) and «Chelsea» (London, England) in the UEFA Champions League games of the 2020/2021 season (n=13)

Technical and tactical actions	Team «MC»		Team «Chelsea»		t	p
	X_1	m_1	X_2	m_2		
• *Touches*	859,1	21,4	720,5	31,4	**3,65**	**<0,01**
• *Passes*	684,5	27,9	535,5	32,2	**3,50**	**<0,01**
• *Dribbles*	22,6	2,0	18,0	1,9	1,67	>0,05
• *Shots*	13,0	1,4	11,2	1,1	1,01	>0,05
• *Aerial duels*	18,8	2,6	31,2	2,2	**3,64**	**<0,01**
• *Tackles attempted*	22,6	1,5	24,2	2,3	0,58	>0,05
• *Interceptions*	9,0	1,1	11,2	1,1	1,41	>0,05
• *Clearances*	10,2	1,4	18,2	2,0	**3,28**	**<0,01**
Blocked shots	2,0	0,7	3,2	0,6	1,30	>0,05
Blocked crosses	8,0	0,7	10,5	1,0	2,05	>0,05

Table 4 shows the average quantity of shots on goal in the games of the team «Manchester City». These tables show that the players of the team «Manchester City» on average per game performed much more shots against their opponents.

Table 4

Quantities of shots on goal of the team «Manchester City» (Manchester, England) in the UEFA Champions League games of the 2020/2021 season (n=13)

• *Shots*	**Team «MC»**		**Rival teams**		t	p
	X_1	m_1	X_2	m_2		
All	13,0	1,4	6,5	1,0	**3,78**	**<0,001**
Goals	1,9	0,3	0,4	0,1	**4,74**	**<0,001**
Shots on target	5,7	0,6	1,8	0,3	**5,81**	**<0,001**
Shots off target	4,0	0,5	2,5	0,4	**2,34**	**<0,05**
Woodworks	0,4	0,2	0,1	0,1	1,34	>0,05
Blocked	3,3	0,6	2,1	0,7	1,30	>0,05
6-yard box	1,3	0,2	0,5	0,3	**2,22**	**<0,05**
Penalty Area	7,0	0,7	3,4	0,6	**3,90**	**<0,001**
Outside of box	4,7	0,7	2,6	0,4	**2,60**	**<0,05**
Right foot	5,9	0,9	3,5	0,7	**2,10**	**<0,05**
Left foot	5,4	0,6	2,2	0,4	**4,44**	**<0,001**
Head	1,6	0,3	0,8	0,2	**2,22**	**<0,05**

In turn, the analysis of the quantitative indicators of shots on goal in the games of the team «Chelsea» shows (Table 5) that the players of this team were insignificantly superior to their rivals in most indicators.

Table 5

Quantities of shots on goal of the team «Chelsea» (London, England) in the UEFA Champions League games of the 2020/2021 season (n=13)

• *Shots*	**Team «Chelsea»**		**Rival teams**		t	p
	X_1	m_1	X_2	m_2		
All	11,2	1,1	9,3	1,0	1,28	>0,05
Goals	1,8	0,4	0,3	0,1	**3,64**	**<0,01**
Shots on target	4,5	0,5	2,8	0,5	**2,40**	**<0,05**
Shots off target	4,1	0,7	3,2	0,4	1,12	>0,05
Woodworks	0,3	0,2	0,2	0,1	0,45	>0,05
Blocked	2,6	0,5	3,2	0,6	0,77	>0,05
6-yard box	0,7	0,3	0,5	0,2	0,55	>0,05
Penalty Area	7,7	0,9	5,5	0,5	**2,14**	**<0,05**
Outside of box	2,8	0,5	3,3	0,6	0,64	>0,05
Right foot	5,9	0,7	4,6	0,4	1,61	>0,05
Left foot	3,4	0,6	2,8	0,6	0,71	>0,05
Head	1,8	0,3	1,8	0,4	0,00	>0,05

At the same time, as a result of a comparative analysis of the quantitative indicators of shots on goal (table 6), it was found that the players of the team «Manchester City» were almost in all respects superior to the players of the team

«Chelsea». However, we found significant differences only in the quantity of shots on goal from outside the penalty area (t=2,21; p<0,05) and the number of shots with the left foot (t=2,36; p<0,05).

Table 6

Quantities of shots on goal of the team «Manchester City» (Manchester, England) and «Chelsea» (London, England) in the UEFA Champions League games of the 2020/2021 season (n=13)

• *Shots*	Team «MC»		Team «Chelsea»		t	p
	X_1	m_1	X_2	m_2		
All	13,0	1,4	11,2	1,1	1,01	>0,05
Goals	1,9	0,3	1,8	0,4	0,20	>0,05
Shots on target	5,7	0,6	4,5	0,5	1,54	>0,05
Shots off target	4,0	0,5	4,1	0,7	0,12	>0,05
Woodworks	0,4	0,2	0,3	0,2	0,35	>0,05
Blocked	3,3	0,6	2,6	0,5	0,90	>0,05
6-yard box	1,3	0,2	0,7	0,3	1,66	>0,05
Penalty Area	7,0	0,7	7,7	0,9	0,61	>0,05
Outside of box	4,7	0,7	2,8	0,5	**2,21**	**<0,05**
Right foot	5,9	0,9	5,9	0,7	0,00	>0,05
Left foot	5,4	0,6	3,4	0,6	**2,36**	**<0,05**
Head	1,6	0,3	1,8	0,3	0,47	>0,05

An analysis of the quantitative indicators of the ball passes of the UEFA Champions League teams shows that the «Manchester City» team significantly outperformed its opponents in these indicators (Table 7).

Table 7

Quantities of passes of the team «Manchester City» (Manchester, England) in the UEFA Champions League games of the 2020/2021 season (n=13)

Passes	Team «MC»		Rival teams		t	p
	X_1	m_1	X_2	m_2		
All	684,5	27,9	442,9	25,1	**6,44**	**<0,001**
Crosses	15,3	2,1	9,1	1,5	**2,40**	**<0,05**
Long	39,3	1,7	47,4	3,7	1,99	>0,05
Short	682,0	28,6	427,6	25,3	**6,66**	**<0,001**
Chipped	47,7	2,6	47,7	3,0	0,00	>0,05
Ground	673,6	28,6	427,3	23,1	**6,70**	**<0,001**
Forward	409,4	14,0	287,8	13,1	**6,34**	**<0,001**
Backward	305,5	15,6	185,1	11,0	**6,31**	**<0,001**
Right	358,6	14,8	239,9	12,6	**6,11**	**<0,001**
Left	359,2	14,0	232,5	11,3	**7,04**	**<0,001**
Defensive third	105,5	9,6	184,6	14,8	**4,48**	**<0,001**
Mid third	413,6	21,3	207,8	12,4	**8,35**	**<0,001**
Final third	202,2	12,3	82,6	7,9	**8,18**	**<0,001**

Thus, the players of this team on average per game performed significantly more crosses of the opposing team (t=2,40; p<0,05), short passes (t=6,66; p<0,001), ground passes (t=6,70; p<0,001), forward (t=6,34; p<0,001), backward (t=6,31; p<0,001), right (t=6,11; p<0,001), left (t=7,04; p<0,001), in the middle zone (t=8,35; p<0,001) and the attack zone (t=8,18; p<0,001).

In turn, in the games of the team «Chelsea» the quantity of passes made by the players of this team and their opponents did not have significant differences (Table 8).

Table 8

Quantities of passes of the team «Chelsea» (London, England) in the UEFA Champions League games of the 2020/2021 season (n=13)

Passes	Team «Chelsea»		Rival teams		t	p
	X_1	m_1	X_2	m_2		
All	535,5	32,2	488,3	33,4	1,02	>0,05
Crosses	14,2	1,5	16,9	2,0	1,08	>0,05
Long	50,5	2,4	58,8	3,4	1,99	>0,05
Short	523,1	34,0	476,2	34,7	0,97	>0,05
Chipped	48,2	1,8	56,2	3,8	1,90	>0,05
Ground	525,4	33,6	478,8	32,9	0,99	>0,05
Forward	350,9	19,0	330,2	18,5	0,78	>0,05
Backward	220,8	14,8	202,9	16,1	0,82	>0,05
Right	290,4	16,3	269,9	18,3	0,84	>0,05
Left	280,8	17,4	262,1	16,4	0,78	>0,05
Defensive third	125,9	10,6	122,7	12,0	0,20	>0,05
Mid third	288,8	18,3	266,4	23,4	0,75	>0,05
Final third	158,8	14,7	145,9	7,6	0,78	>0,05

Table 9 shows the average ball passes of of the team «Manchester City» and «Chelsea» in 13 UEFA Champions League games.

Analysis of the data shows that «Manchester City» players made significantly more short passes (t=3,58; p<0,01), passes ground (t=3,36; p<0,01), forward (t=2,48; p<0,05), backward (t=3,94; p<0,001), right (t=3,10; p<0,01), left (t=3,51; p<0,01), in the middle zone (t=4,44; p<0,001) and the attack zone (t=2,26; p<0,05). The «Chelsea» players outperformed their counterparts only in terms of the quantity of long passes (t=3,81; p<0,001).

Table 9

Quantities of passes of the team «Manchester City» (Manchester, England) and «Chelsea» (London, England) in the UEFA Champions League games of the 2020/2021 season (n=13)

Passes	Team «MC»		Team «Chelsea»		t	p
	X_1	m_1	X_2	m_2		
All	684,5	27,9	535,5	32,2	**3,50**	**<0,01**
Crosses	15,3	2,1	14,2	1,5	0,43	>0,05
Long	39,3	1,7	50,5	2,4	**3,81**	**<0,001**
Short	682,0	28,6	523,1	34,0	**3,58**	**<0,01**
Chipped	47,7	2,6	48,2	1,8	0,16	>0,05
Ground	673,6	28,6	525,4	33,6	**3,36**	**<0,01**
Forward	409,4	14,0	350,9	19,0	**2,48**	**<0,05**
Backward	305,5	15,6	220,8	14,8	**3,94**	**<0,001**
Right	358,6	14,8	290,4	16,3	**3,10**	**<0,01**
Left	359,2	14,0	280,8	17,4	**3,51**	**<0,01**
Defensive third	105,5	9,6	125,9	10,6	1,43	>0,05
Mid third	413,6	21,3	288,8	18,3	**4,44**	**<0,001**
Final third	202,2	12,3	158,8	14,7	**2,26**	**<0,05**

Conclusions / Discussion

The data of the study show the differences in the quantitative indicators of defensive and offensive technical and tactical actions in the structure of competitive activities of the best football clubs in Europe in the UEFA Champions League games of the 2020/2021 season. The team of «Manchester City» (finalist of the UEFA Champions League) in the games of this tournament surpassed their opponents in terms of attacking TTA. In turn, the team «Chelsea» (winner of the UEFA Champions League) had the best performance of defensive TTA.

The results of the study confirmed the information on the quantitative indicators of team TTA teams of different levels (Shamardin V., 2002, 2012, Kostyukevich V., 2006). Data on the peculiarities of attacking and defensive TTAs by teams of different levels (Perevoznyk V., Mulyk V., Payevsky V., 2020, Perevoznyk V.I., Zhurid S.M., Marchenko V., Pertsukhov A.A., 2018, 2020). Models of competitive activity of the best teams-participants of the UEFA Champions League of the 2020/2021 season have been developed.

The provisions and conclusions of this study can be taken into account in the formation of club and national teams of different levels and in the planning of technical and tactical training of players of different qualifications.

Prospects for further research. Further research can be devoted to establishing the peculiarities of the implementation of the TTA teams of the Premier League of the Ukrainian championship, the first and second leagues of the Ukrainian championship.

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CORRELATION DEPENDENCE OF THE USE OF GENERAL AND SPECIAL-PREPARATORY (BOXING EQUIPMENT) EXERCISES AND PSYCHOPHYSIOLOGICAL INDICATORS AND THE LEVEL OF MANIFESTATION OF THE STRENGTH OF PUNCHES BY YOUNG BOXERS OF 15-16 YEARS OLD

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Purpose: to establish a correlation relationship between general and special preparatory exercises and strength indicators of punches with hands, as well as psychophysiological qualities that arise during training.

Material and methods: the research was carried out with the involvement of young boxers 15-16 years old, who made up an experimental group in the amount of 12 athletes, they carried out a one-cycle annual training process according to the CYSS program at the beginning of the preparatory period (control testing was carried out after the retractive mesocycle), and at the end of the competitive period repeated testing was carried out using the means of general and special physical training and psychophysiological indicators. The above made it possible to establish a correlation dependence between the indicated indicators.

Results: the results obtained allow, when building a training process aimed at increasing the absolute and relative strength of a punch in boxing, to take into account the effectiveness of using general and special preparatory exercises in relation to the main punching movements of boxers.

Conclusions: the results obtained make it possible to more effectively plan the training process with the use of general and special-preparatory exercises for solving problems of the development of speed-strength qualities, which are the basis of the absolute and relative strength of the punch in boxing.

Keywords: young boxers, physical exercises, psychophysiological indicators, hand punch force.

Introduction

An important factor in increasing the effectiveness of training young boxers is the influence of the use of preparatory and special-preparatory (including with the use of boxing devices) exercises on the level of power indicators of punches and psychophysiological indicators [8, 11, 12, 13].

Today there is a disagreement in the opinions of coaches on the training impact of general physical training and special physical training on the formation of special physical qualities of athletes [1, 4, 7, 11, 15]. At the same time, it is noted [2, 3, 6, 14] that when selecting means of special physical training, one should be guided by the principle of dynamic correspondence, according to which they must correspond in the structure of movements to the competitive right.

Therefore, the main provisions that should be taken into account when building the training process of young boxers is the interdependence of the exercises used to solve problems related to the development of motor qualities. As noted earlier [9, 11], effective exercises for the development of motor qualities are those exercises in the performance of which muscle groups are involved, taking part in the main motor (competitive) action in terms of the amplitude and direction of movement, as well as the structure of efforts during their execution. In addition, special preparatory exercises contribute to the formation of a functional system that ensures the performance of a competitive exercise [5, 8, 13].

Thus, when forming complexes of exercises, it is necessary to clearly understand how an individual exercise affects the development of motor qualities. Therefore, it is important to establish a correlation relationship between general and special preparatory exercises and indicators of the main motor actions, which are

punches in boxing, and their influence on psychophysiological indicators that are formed under their influence.

Purpose of the study is to establish a correlation relationship between general and special preparatory exercises and strength indicators of punches with hands, as well as psychophysiological qualities that arise during training.

Material and Methods of research

The studies were carried out with the involvement of young boxers 15-16 years old, made up an experimental group in the amount of 12 athletes who carried out a one-cycle one-year training process according to the CYSS program at the beginning of the preparatory period (control testing was carried out after the retracting mesocycle), and at the end of the competitive period, repeated testing was carried out with using the means of general and special physical training and psychophysiological indicators. The above made it possible to establish a correlation dependence between the indicated indicators.

Results of the research

The obtained results allow, when constructing a training process aimed at increasing the absolute and relative strength of a punch in boxing, to take into account the effectiveness of using general and special-preparatory exercises in relation to the main punching movements of boxers.

Table 1

Correlation relationship between indicators of general physical fitness and psychophysiological indicators of young boxers 15-16 years old

№ i/o	Psychophysiological indicators	Indicators of general physical preparation					
		1	2	3	4	5	6
1	Rufier index	0,24	0,25	0,46	0,33	0,50	0,52
2	Romberg test	0,36	0,32	0,40	0,36	0,33	0,30
3	Simple reaction time to sound	0,52	0,44	0,41	0,46	0,30	0,26
4	Selection reaction time	0,34	0,33	0,30	0,42	0,26	0,28
5	Simple reaction time to light	0,30	0,28	0,32	0,38	0,28	0,26
6	Efficiency of work according to the Schulte test	0,48	0,42	0,40	0,36	0,30	0,31
7	Degree of efficiency of the test Schulte	0,45	0,40	0,43	0,38	0,41	0,44
8	Mental stability according to the Schulte test	0,40	0,36	0,32	0,30	0,40	0,52
9	Concentration on the Bourdon test	0,36	0,32	0,31	0,46	0,41	0,38
10	Switching attention with the Bourdon test	0,28	0,41	0,42	0,40	0,38	0,36
11	Tapping test, frequency of movements	0,30	0,38	0,33	0,44	0,42	0,26

Note: GPP indicators: 1) jump up from the spot; 2) throwing a medicine ball from behind the head; 3) throwing a tennis ball from a place; 4) push-up; 5) pull-up on the bar

The analysis of the correlation dependence of various indicators of readiness among young boxers of 15-16 years old established that the use of means of general physical training has mainly an average and below average level of correlation with psychophysiological indicators. The most significant effect of using a standing jump with a response time to sound (r=0,52), push-up with the Ruffier index (r=0,50) and pull-up on the bar with the Ruffier index (r=0,52), mental stability according to the Schulte test (r=0,52).

Table 2

Correlation relationship of the use of indicators of special boxing equipment and psychophysiological indicators of young boxers 15-16 years old

№ i/o	Special physical training exercises	Psychophysiological indicators										
		1	2	3	4	5	6	7	8	9	10	11
1	With a skipping rope	0,61	0,52	0,48	0,51	0,48	0,56	0,55	0,58	0,60	0,58	0,82
2	With a bag	0,60	0,56	0,57	0,65	0,53	0,58	0,56	0,60	0,61	0,60	0,79
3	With pear	0,62	0,54	0,56	0,68	0,54	0,60	0,61	0,61	0,60	0,63	0,80
4	With wall cushion	0,59	0,58	0,59	0,63	0,52	0,57	0,58	0,59	0,61	0,60	0,81
5	With pneumatic bag	0,64	0,56	0,58	0,70	0,56	0,62	0,63	0,63	0,61	0,65	0,80
6	With a ball on elastic bands	0,63	0,57	0,59	0,71	0,57	0,61	0,65	0,63	0,60	0,64	0,81
7	With a small hanging ball	0,61	0,59	0,60	0,72	0,56	0,60	0,64	0,65	0,61	0,63	0,80
8	With boxing bags	0,58	0,61	0,60	0,69	0,60	0,61	0,63	0,64	0,68	0,67	0,78

Note: indicators: 1 - Rufier index; 2 - Romberg's test; 3 - time of a simple reaction to sound; 4 - selection reaction time; 5 - time of a simple reaction to light; 6 - efficiency of work according to the Schulte test; 7 - degree of efficiency of the test Schulte; 8 - mental stability according to the Schulte test; 9 - concentration of attention according to the Bourdon test; 10 - switching attention with the Bourdon test; 11 - tapping test, frequency of movements

The use of special boxing exercises, to a greater extent than preparatory exercises, influences the formation of psychophysiological indicators of young boxers aged 15-16 (Table 3).

So, exercises with a skipping rope have a significant correlation for almost all studied psychophysiological indicators, the largest of which is the tapping test data (r=0,82). Exercises with a "bag" and "pear" have the greatest correlation with the Rufier Index (r=0,60; 0,62), the choice reaction time (r=0,65; 0,68), mental stability according to the Schulte test (r=0,60; 0,61), concentration and attention switching with the Bourdon test (r=0,61; 0,60; 0,60; 0,63) and tapping test (r=0,79; 0,80).

Table 3

Correlation relationship between the indicators of special exercises and indicators of the power of kicks of young boxers 15-16 years old

№ i/o	Special physical training exercises	Kick force indicators			
		1	2	3	4
1	With a skipping rope	0,32	0,30	0,36	0,35
2	With a bag	0,67	0,62	0,61	0,60
3	With pear	0,51	0,50	0,50	0,49
4	With wall cushion	0,71	0,68	0,67	0,64
5	With pneumatic bag	0,57	0,54	0,52	0,50
6	With a ball on elastic bands	0,54	0,52	0,50	0,50
7	With a small hanging ball	0,51	0,50	0,52	0,51
8	With boxing bags	0,60	0,58	0,57	0,54

Note: indicators: 1 - F_{abs} (absolute strength; direct kick) 2 - F_{abs} (absolute strength; side kick) 3 - F_{rel} (relative strength; direct kick) 4 F_{rel} (relative strength; side kick).

The use of the “wall pillow” exercise significantly correlates with the choice reaction time (r=0,70), work efficiency and the degree of work capacity according to the Schulte test (r=0,63). Exercises requiring the manifestation of a reaction of choice: with a pneumatic bag and with a ball on elastic bands correlate with the Rufier index (r=0,64; 0,63), choice reaction time (r=0,70; 0,71), work efficiency , the degree of working capacity and psychophysiological stability according to the Schulte test (r=0,62; 0,61; 0,63; 0,65; 0,63; 0,63), concentration and attention switching with the Schulte test (r=0,61; 0,60; 0,65; 0,64) and the tapping test (r=0,80; 0,81). The performance of exercises with a small hanging ball and boxing paws by young boxers 15-16 years old significantly correlates with the time of a simple reaction to sound (r=0,60; 0,60), choice reaction time (r=0,72; 0,69), efficiency of work, degree of efficiency and mental stability according to the Schulte test (r=0,60; 0,61; 0,64; 0,63; 0,65; 0,64), as well as concentration and attention switching with the Bourdon test (r=0,61; 0,68; 0,63; 0,67) and, to a greater extent, exercises with boxing paws (r=0,81; 0,78). The use of special boxing equipment has a correlation with all manifestations of strength indicators.

So, the use of exercises with a "bag" affects the absolute and relative strength of the direct and lateral impact (r=0,67; 0,62; 0,61; 0,60), with the "pear" (according to r=0,51; 0,50; 0,50; 0,49), with a wall cushion (r=0,71; 0,68; 0,67; 0,64), with a pneumatic bulb (r=0,57; 0,54; 0,52; 0,50), with a ball with elastic bands (r=0,54;

0,52; 0,50; 0,50), with a small hanging ball (r=0,51; 0,50; 0,52; 0,51) and with boxing paws (r=0,60; 0,58; 0,57; 0,54). That is, the greatest manifestation of the power of blows is carried out due to boxing equipment, which is immovable, and there is an opportunity to put in the maximum blow (exercises with a bag, with a wall pillow).

In turn, the use of most of the physical training means does not have a significant correlation with the indicators of the absolute and relative strength of kicks and lateral kicks in young boxers 15-16 years old (Table 4).

Table 4

Correlation relationship between indicators of absolute and relative strength of kicks with hands and indicators of GPP

№ i/o	Indicators of absolute and relative strength of kicks	Показники ЗФП				
		1	2	3	4	5
1	F_{abs} (absolute strength; direct kick)	0,37	0,21	0,42	0,56	0,36
2	F_{abs} (absolute strength; side kick)	0,32	0,20	0,38	0,46	0,32
3	F_{rel} (relative strength; direct kick)	0,40	0,24	0,46	0,54	0,38
4	F_{rel} (relative strength; side kick).	0,36	0,22	0,44	0,52	0,36

Note: GPP indicators: 1 - medicine ball throw; 2 - long jump from a place; 3 push-ups for 30 s; 4 - pull-ups on the crossbar in 30 s; 5 - hand dynamometry

The most significant correlation was found in pull-ups on the crossbar for 30 s: Fabs (direct kick) r=0,56; Frel (direct kick) r=0,54 and Fabs (side kick) r=0,52 and push-ups for 30 s: F_{abs} (direct kick) r=0,52; F_{abs} (side kick) r=0,50; F_{rel} (direct kick) r=0,56.

That is, the use of preparatory exercises in their structure of movements and the manifestation of efforts do not have much significance in increasing the strength of kicks.

Conclusions / Discussion

The obtained results allow more effective planning of the training process with the use of general and special training exercises to solve problems related to the development of speed and strength qualities.

It was found that the greatest correlation with the indicators of the strength of the kicks of young boxers have exercises with the use of boxing equipment, which is

immovable (exercises with a bag, with a wall pear, with boxing bags), in turn, the use of kicks on motor objects to a greater extent affects the psychophysiological indicators (time of simple reaction to sound, light and choice).

The effectiveness of the use of preparatory exercises for the development of indices of absolute and relative strength of kicks with hands is less significant, since they do not correspond to the structure and dynamics of the boxer's punching movements.

Prospects for further research provide for the development of the training process of young boxers 15-16 years old, taking into account the use of the correlation relationship of the means of general physical training, special physical training and psychophysiological indicators.

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IMPROVEMENT OF THE METHODOLOGY OF PHYSICAL TRAINING OF CADETS OF THE WESTERN MILITARY DISTRICT WITH SPECIFIC TRAINING CONDITIONS OF THE MINISTRY OF INTERNAL AFFAIRS OF UKRAINE

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Purpose: to develop and experimentally substantiate the improved methodology of physical training of cadets.

Material and methods: the study was carried out at the educational and sports base of the KhNUIA. The study involved 46 cadets from two academic groups of the second year of study. Experimental (n-24) and control (n-22) groups were created. The experiment continued throughout the fourth semester. The following research methods were used in the work: analysis and generalization of scientific and methodological information, pedagogical observation, testing, pedagogical experiment, methods of mathematical statistics.

Results: due to the use of the experimental methodology, selection of means and methodology of complex exercises fulfillment, an increase in the indices of physical and special readiness of cadets was obtained.

Conclusions: the methodology of physical fitness improvement was developed; it provided a reliable improvement of cadets' physical readiness indices, contributes to the successful mastering of self-defense tactics exercises.

Keywords: cadets, physical training, testing, physical qualities, crossfit.

Introduction

At the present stage of development and formation of independence of the Ukrainian state, the process of social, political, economic transformations is aimed at democratizing and reforming all spheres of civil society: science, education, health care, army, police in accordance with European and world standards. But due to the difficult socio-economic and moral-political conditions, the development of independent Ukrainian statehood is accompanied by a high level of criminality, negatively affects the state of law and order in the country [2; 6; 7].

In such conditions, society and the state clearly define the tasks for the employees of the National Police of Ukraine. So, in the regulatory documents, in particular in the Law of Ukraine "On the National Police" (2015), it is regulated and specified that the police, while exercising the powers defined by this Law, are authorized to apply the following coercive measures: physical pressure (force); use of special means; use of firearms [8].

In this regard, at the present stage of development of professional education in the training of specialists of the National Police, a special place is occupied by the problem of the formation of an appropriate level of physical fitness. But the expediency of solving this problem is associated with the need to overcome the contradictions between modern requirements, which is declared in the regulatory and legislative documents of the Ministry of Internal Affairs of Ukraine on the formation of physical fitness and the actually existing level of general physical preparedness of cadets, between the objective need for the formation of an appropriate level of physical fitness and the level of general physical preparedness of applicants entering higher educational institutions of the Ministry of Internal Affairs; between the significantly significant existing potential for the complex formation of a sufficient level of physical preparedness and effective combination with other areas of professional training, in particular tactical, fire, psychological; between the need for

effective mastery of self-defense techniques and motor-coordination abilities of cadets [1; 3; 4; 5].

In this regard, the search for the most effective means and methods of physical training within the framework of existing regulatory and legislative requirements is of particular relevance.

Purpose of the study: to develop and experimentally substantiate the improved methodology of physical training of cadets of the Kharkiv National University of Internal Affairs (KhNUIA).

Material and Methods of research

Research methods: analysis and generalization of scientific and methodological information, pedagogical observation, testing, pedagogical experiment, methods of mathematical statistics.

The study was carried out at the educational and sports base of the KhNUIA. The study involved 46 cadets from two academic groups of the second year of study. An experimental and control group was created. The experiment continued throughout the fourth semester. Conducted 40 practical sessions.

Physical fitness of cadets was determined using the following test exercises: running 100 m; complex strength exercise (30 s) - flexion, extension of the arms in a lying position, 30 s - lifting the body from a supine position); pull-up on the bar; standing long jump; lifting the body from a supine position bend the legs; a specialized complex test (on the 10-meter part of the tatami the following were performed - forward roll, backward roll, 5 kiks on the bag - 2 feet, 3-handed kiks - front step and restraints - bending the arm behind the back with a jerk) and 1000 m running. Training sessions for cadets of the control group were conducted entirely according to the existing curriculum.

Results of the research

The experimental group (24 cadets) at the end of the main part of the lesson for 8-10 minutes performed a complex of 11-12 exercises of speed-strength orientation and exercises of self-defense tactics using a circular method according to the crossfit program. During the transition from exercise to exercise, it was gradually reduced

from 30 to 3-5 s. The complex included the following exercises: jumping up from a half-squat position; lifting the torso and legs from a supine position; flexion and extension of the arms in a lying position; performing 2 forward rolls, 2 backward; from a lunge position with a foot forward in a jump, a change in the position of the legs; pull-up on the bar; protection from blows with legs and arms lifting kettlebells (16 or 24 kg) with both hands to the chest; jumping onto a gymnastic bench with two legs; lifting the body from a supine position; legs bent; release from grips; in the hang on the crossbar, raising the legs up. The exercise time gradually increased from 30 to 60 s.

The analysis of the initial test results at the beginning of the study showed that the difference between the physical readiness indices of the cadets of the experimental and control groups did not have a significant difference (the value of the Student's t-criterion ranged from 0,31 to 1,29; $p>0,05$). At the end of the study, among the cadets of the experimental group, the indices of physical fitness improved from 3,3 % to 25,1 % (on average by 10,78 %) (Table 1).

Table 1

Physical readiness indices of cadets of the experimental group (n-24) before and at the end of the experiment

Test	Before experiment	After texperiment	Percentage of improvement	Reliability	
	x±m	x±m	%	t	p
Run 100 (s)	14,61±0,15	14,13±0,13	3,3	2,42	<0,05
Complex strength exercise (once per minute)	55,41±1,34	62,73±1,08	13,2	4,66	<0,05
Pull-up (times)	12,26±0,54	15,34±0,27	25,1	5,13	<0,05
Standing long jump (cm)	234,41±1,63	248,73±1,13	6,1	7,26	<0,05
Lifting the torso (once per minute)	49,13±1,26	54,38±0,81	10,7	3,5	<0,05
Specialized test (s)	13,4±0,51	11,59±0,21	13,7	3,36	<0,05
Run 1000 m (s)	243,61±4,39	235,29±2,62	3,5	1,63	<0,05

Improvement of test results in the experimental group of cadets is confirmed by the reliability of changes ($t=2,42-5.13$; $p<0,05-0,001$), only in the 1000-meter run the average group results were unreliable ($t=1,63$; $p>0,05$) (Table 1).

Table 2

Physical readiness indices of cadets of the control group (n-24) before and at the end of the experiment

Test	Before experiment	After texperiment	Percentage of improvement	Reliability	
	x±m	x±m	%	t	p
Run 100 (s)	14,48±0,16	14,27±0,27	1,5	0,67	>0,05
Complex strength exercise (once per minute)	54,69±1,12	58,36±1,29	6,7	1,98	>0,05
Pull-up (times)	12,45±0,48	13,68±0,64	9,8	1,53	>0,05
Standing long jump (cm)	233,71±1,96	236,49±1,78	1,18	1,05	>0,05
Lifting the torso (once per minute)	48,64±1,11	50,86±0,93	4,5	1,54	>0,05
Specialized test (s)	13,18±0,43	12,64±0,39	4,1	0,95	>0,05
Run 1000 m (s)	245,48±4,41	241,69±3,18	1,5	0,55	>0,05

In cadets of the control group, the indicators of test exercises at the end of the study improved from 1,5 % to 9,8 % (on average by 4,18 %), but not significantly (t=0,55-1,98; p<0,05) (Table 2).

Table 3

Indicators of physical readiness of cadets of the control and experimental groups at the end of the study

Test	Control group (n-22)	Variability (V)	Experimental group (n-24)	Variability (V)	Reliability	
	x±m	%	x±m	%	t	p
Run 100 (s)	14,27±0,27	8,9	14,13±0,13	4,5	0,47	>0,05
Complex strength exercise (once per minute)	58,36±1,29	10,4	62,73±1,08	8,4	2,60	<0,05
Pull-up (times)	13,68±0,64	21,9	15,34±0,27	8,6	2,51	<0,05
Standing long jump (cm)	236,49±1,78	3,5	248,73±1,13	2,2	5,80	<0,05
Lifting the torso (once per minute)	50,86±0,93	8,6	54,38±0,81	6,2	2,86	<0,05
Specialized test (s)	12,64±0,39	14,5	11,59±0,21	8,8	2,37	<0,05
Run 1000 m (s)	241,69±3,18	6,2	235,29±2,62	5,4	1,30	>0,05

Comparative analysis of physical readiness indices among cadets of the experimental and control groups at the end of the study indicates that the experimental training program allowed to significantly improve the results in speed-

strength test exercises and in a specialized test (the value of the t criterion ranges from 2,37 to 5,80; $p<0,05$-0,001). In running exercises, the changes were significant, but insignificant (100 m – t=0,47; $p<0,05$; 1000 m – t =1,30; $p<0,05$) (Table 3).

Comparison of the coefficients of variations (V) shows that the density of the results in accordance with the homogeneity of the indicators of test exercises at the end of the experiment among the cadets of the experimental group is much better. So, in the experimental group, the value of the coefficient of variation ranges from 2,2 to 8,8 (on average, V=6,3%), and in the control group, the average indicator is V=10,57%, which indicates a large variability of cadets' physical readiness indices of this group.

Conclusions / Discussion

In recent years, considerable attention has been paid to the problem of improving the methodology of cadets' physical fitness and is considered in a significant number of scientific studies [2, 3, 7] These works are aimed at solving certain aspects of the process of physical training. Taking into account the indicated contradictions between the regulatory and legislative requirements and the level of physical fitness of future officers of the National Police [2, 3, 4, 5], it is necessary to search for the most effective means, methods and forms of physical training of cadets.

In this regard, a study was carried out on the use of a complex of speed-strength exercises and exercises in self-defense tactics according to the crossfit program allowed to significantly improve the results in 100 m running (t=2,42; $p<0,05$), in complex strength right (t=4,66; $p<0,01$), pulling up (t=5,13; $p<0,001$), lifting the trunk (t=3,5; $p<0,05$) and in exercises in self-defense tactics (t=3,36; $p<0,05$). Therefore, in order to improve endurance, it is necessary to increase the volume of running training in the training program for cadets.

Prospect of further research consists in certain optimal means and methods of speed-strength and running training of cadets.

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USE OF CHOREOGRAPHY ELEMENTS IN THE TRAINING PROCESS OF NOVICE ATHLETES FOR THE SUCCESSFUL DEVELOPMENT OF RHYTHMIC GYMNASTICS PROGRAMS

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Purpose: apply choreographic training in the training process of novice athletes and determine its influence on the performance of basic rhythmic gymnastics exercises.

Material and methods: the pedagogical experiment was carried out on the basis of the Complex Children's Sports School No. 1, Kyivskyi District (Kharkov) among novice athletes 5-6 years old. The study involved 24 gymnasts: the control group (n=12) conducted the training process according to the school program, experimental (n=12) with the additional use of choreographic training. To evaluate the artistic and technical components, 2 choreographers with judicial experience and 4 trainers of the national category were involved. Because the level of preparedness of young athletes was at the initial stage, a 5-point assessment scale was applied. The first assessment of the basic exercises in rhythmic gymnastics among young athletes was carried out in the study groups at the beginning of the school year, the second - at the end of the half-year.

Results: in the process of using choreographic exercises for mastering programs in rhythmic gymnastics for novice athletes 5-6 years old from the experimental group, reliably better assessment results were obtained in relation to the control group in performing the following components: "expressiveness of body movement" ($t=4,97$; $p<0,001$), "balance" ($t=4,48$; $p<0,001$), "character" ($t=3,71$;

p<0,01), "rhythm" (t=4,18; p<0,01), "jumping" (t=3,22; p<0,01) and "turns" (t=3,77; p<0,01).

Conclusions: as a result of the research, it was found that the additional use of choreography in the training process of novice athletes of 5-6 years old effectively affects the performance of basic exercises in rhythmic gymnastics, which indicates the successful development of programs in this sport. It is during these classes that posture is formed, the musculoskeletal system is strengthened and the culture of movements of the gymnasts is formed.

Keywords: rhythmic gymnastics, choreography, novice athletes, artistic preparedness.

Introduction

Rhythmic gymnastics is a very feminine sport, a kind of combination of athleticism with artistry and music. It should be noted that the important thing is the choice of a number of components: artistic ones - character, rhythm, dynamic changes, expressiveness of body movement and technical ones- jumps, turns, balances and pre-acrobatic elements [8]. However, there is an insufficient level of assimilation of these components in the training process of novice athletes who are engaged in rhythmic gymnastics. Indeed, in addition to the technical execution of the program and the level of complexity, the judges also evaluate artistry and choreography.

Nowadays choreography has become an integral part of the training of high-level gymnasts, and the earlier these classes are involved, the better the result can be achieved. [5]. According to A.V. Martynenko, familiarizing preschool children with classical dance contributes to the correct posture of the torso, arms and legs, strengthening the muscles of the body, developing musical-movement coordination, awareness of the aesthetics and beauty of choreographic movements [4]. Kyzim P.N. in his scientific work states that the usage of modern directions of choreography in the training of novice athletes takes place, but the usage of the folk stage dance movements is mostly not traceable [2].

Thus, the analysis of special scientific and methodological literature raises the topic of the importance of choreography in the training process of novice athletes who are engaged in rhythmic gymnastics.

The research was carried out in accordance with the initiative theme of the scientific research of the Department of Gymnastics, Dance Sports and Choreography of KSAPC: "Theoretical and methodological foundations of the backbone components of physical culture (sports, fitness and recreation) for 2020-2025", state registration number 0120U01215.

Purpose of the study: to apply choreographic training in the training process of novice athletes and determine its influence on the performance of basic rhythmic gymnastics exercises.

Material and Methods of research

Research methods: the pedagogical experiment was carried out on the basis of the Complex Children's Sports School No. 1, Kyivskyi District (Kharkiv) among novice 5-6 year old athletes. 24 gymnasts were involved in the studying: the control group (n=12) conducted the training process according to the school program, the experimental one (n=12) did with the additional usage of choreographic training. 2 choreographers with judicial experience and 4 trainers of the national category were involved to evaluate the artistic and technical components. Due to the fact that the level of preparation of young athletes was at the initial stage, a 5-point assessment scale was applied. The first assessment of the basic exercises in rhythmic gymnastics among young athletes was carried out in the studied groups at the beginning of the school year, the second - at the end of the 6-month period.

Results of the research

The research was conducted during one academic semester. The experimental group trained three times a week for two hours: one hour was devoted to the general training of gymnasts according to the program of the Children's Youth Sports School (CYSS) [7], and the second hour consisted of choreography at the bar and in the middle of the hall. The choreography classes included the standard choreographic training for novice athletes. The control group also trained three times a week for two

hours, but all the time was devoted to general training in rhythmic gymnastics. The results of the initial assessment are shown in Tables 1 and 2.

Table 1

Results of assessment of the experimental group at the beginning of the pedagogical experiment (points)

Gymnasts	Artistic components of assessment, points				Technical components of assessment, points			
	Character	Rhythm	Dynamic changes	Expressiveness of body movement	Jumping	Turns	Balance	Pre-acrobatic elements
1	4	4	4	4	3	3	3	4
2	3	4	3	3	4	3	4	4
3	4	5	4	4	4	3	4	3
4	4	3	3	3	2	3	3	3
5	3	4	3	3	4	3	4	3
6	4	4	5	3	3	4	4	4
7	3	4	4	3	3	3	4	3
8	4	3	2	3	4	3	4	3
9	4	3	4	4	3	3	3	3
10	3	4	3	3	3	4	4	5
11	4	4	4	3	4	3	4	4
12	3	4	3	4	4	5	4	3
$\bar{X}$	3,58	3,83	3,50	3,33	3,42	3,33	3,75	3,50
m	0,16	0,17	0,24	0,15	0,20	0,20	0,14	0,20

Table 2

Results of assessment of the control group at the beginning of the pedagogical experiment (points)

Gymnasts	Artistic components of assessment, points				Technical components of assessment, points			
	Character	Rhythm	Dynamic changes	Expressiveness of body movement	Jumping	Turns	Balance	Pre-acrobatic elements
1	3	4	3	4	4	4	4	4
2	5	3	4	4	4	3	4	3
3	3	3	4	3	4	4	4	4
4	4	3	3	4	4	3	3	4
5	4	3	3	3	4	3	4	3
6	3	4	4	3	3	2	3	3
7	3	3	2	3	4	4	3	4
8	4	3	3	3	3	3	3	4
9	3	3	4	4	4	5	4	3
10	3	4	3	4	3	3	4	4
11	4	3	4	3	4	4	4	5
12	3	3	3	2	4	3	3	3
$\bar{X}$	3,5	3,25	3,33	3,33	3,75	3,42	3,58	3,67
m	0,20	0,14	0,20	0,20	0,14	0,24	0,16	0,20

At the beginning of the research it was assumed that an experimental method should be used to improve the performance of novice 5-6 year old athletes competing in the CYSS rhythmic gymnastics program .

The indicators of both artistic and technical qualities of novice athletes were increased in the experimental group during the implementation of choreography exercises, which significantly affect the performance of basic rhythmic gymnastics exercises. Statistical test results at the end of the pedagogical experiment are shown in tables 3, 4.

Table 3

Statistical readiness indicators of the pedagogical experiment experimental group gymnasts (n = 12) (points)

Components	The constituents of assessment components	Experimental group (n=12)		t_e	p
		initially	finally		
		$\bar{X} \pm m$, *points*			
Artistic	Character	3,58±0,16	4,42±0,16	3,71	<0,01
	Rhythm	3,83±0,17	4,75±0,14	4,18	<0,01
	Dynamic changes	3,50±0,24	4,33±0,23	2,50	<0,05
	Expressiveness of body movement	3,33±0,15	4,42±0,16	4,97	<0,001
Technical	Jumping	3,42±0,20	4,00±0,20	3,22	<0,01
	Turns	3,33±0,20	4,25±0,14	3,77	<0,01
	Balance	3,75±0,14	4,67±0,15	4,48	<0,001
	Pre-acrobatic elements	3,50±0,20	4,33±0,20	2,93	<0,05

The most significant (p<0,001) positive shifts have been obtained in terms of expressiveness of body movement and balance. The indicators have improved by 33% and 25% in absolute terms. Therefore, the choreographic training fully contributes to better and more coordinated body movements combined with balance.

It should be noticed that the indicators (p<0,01) have less improved in the components of character assessment (t=3,71), the average score has increased by 0,8 points; of rhythm (t=4,18), the average score has increased by 0,9 points; of jumping (t=3,22), the average score has increased by 0,6 points and turns (t=3,77), the average score has increased by 0,9 points. There have been also positive changes (p<0,05) in such indicators as dynamic changes (t=2,50) and pre-acrobatic elements (t=2,93), the average score of these indicators has increased by 0,8 points. This shows

that the usage of choreography in the training process in accordance with each exercise allows you to improve the quality of performance of the basic elements of rhythmic gymnastics at the stage of initial training.

Table 4

Statistical readiness indicators of the pedagogical experiment control group gymnasts (n = 12) (points)

Components	The constituents of components of assessment	Control group (n=12)		t_e	p
		initially	finally		
		$\bar{X} \pm m$, *points*			
Artistic	Character	3,50±0,20	3,58±0,16	0,31	>0,05
	Rhythm	3,25±0,14	3,42±0,16	0,80	>0,05
	Dynamic changes	3,33±0,20	3,50±0,24	0,54	>0,05
	Expressiveness of body movement	3,33±0,20	3,25±0,14	0,32	>0,05
Technical	Jumping	3,75±0,14	3,83±0,17	0,36	>0,05
	Turns	3,42±0,24	3,50±0,20	0,26	>0,05
	Balance	3,58±0,16	3,75±0,14	0,79	>0,05
	Pre-acrobatic elements	3,67±0,17	3,5±0,16	0,60	>0,05

At the same time the dynamics of changes in the assessment of the components of the fulfillment of the competitive program at the beginning and after the pedagogical research in the control group is highlighted in the following results: expert assessment of the component "character" in the group in percentage terms has increased by 2,3 % (t=0,31, p>0,05), of the component "rhythm" - by 5,2 % (t=0,80; p>0,05), of the component "dynamic changes" - by 5,1% (t = 0,54; p>0,05), of the component "jumping" - by 2,1% (t=0,36; p>0,05), of the component "turns" - by 2,3 % (t=0,26, p>0,05), of the component "balance" - by 4,7 % (t=0,79, p>0,05). But the expert assessment of such components as "expressiveness of body movement" (t=0,32; p<0,05) and "pre-acrobatic elements" (t=0,60; p>0,05) have decreased by 2,4 % and 4,6 % respectively.

When comparing the indicators of the level of technical and artistic readiness of gymnasts from the control and experimental groups, the reliability of the results in all components of the competitive program is observed (Fig. 1).

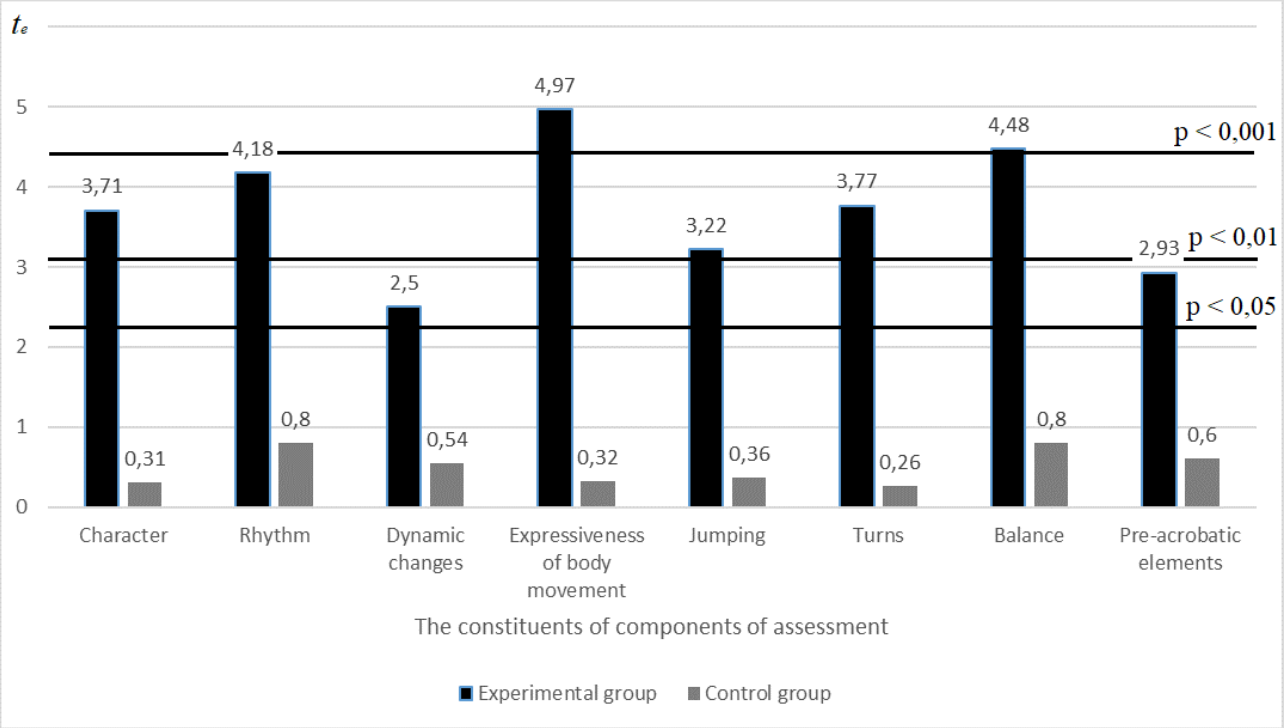

Fig. 1. Reliability of readiness level indicators of control and experimental groups gymnasts after pedagogical experiment

A positive difference was found in favor of the experimental group in the comparative characteristic of the average statistical assessment of the components of the competitive program fulfillment by novice gymnasts in rhythmic gymnastics. The percentage is: the control group – 3,9 %, the experimental group – 25 %.

Table 5

Results of comparing the assessments of the gymnasts of the control and experimental groups obtained at the end of the pedagogical experiment (points)

Components	The constituents of components of assessment	Experimental group (n=12)	Control group (n=12)	t_e	p
		$\overline{X} \pm m$, points			
Artistic	Character	4,42±0,16	3,58±0,16	3,71	<0,01
	Rhythm	4,75±0,14	3,42±0,16	6,26	<0,001
	Dynamic changes	4,33±0,23	3,50±0,24	2,50	<0,05
	Expressiveness of body movement	4,42±0,16	3,25±0,14	5,50	<0,001
Technical	Jumping	4,00±0,13	3,83±0,17	0,79	>0,05
	Turns	4,25±0,14	3,50±0,20	3,07	<0,01
	Balance	4,67±0,15	3,75±0,14	4,48	<0,001
	Pre-acrobatic elements	4,33±0,20	3,50±0,20	2,93	<0,01

Table 5 shows the results of comparing the average scores of gymnasts obtained at the end of the pedagogical experiment. The indicators of the experimental group have significantly improved in the artistic components - "rhythm" ($t=6,26$; $p<0,001$) and "expressiveness of body movement" ($t=5,50$; $p<0,001$), and in technical components - "balance" ($t=4,48$; $p<0,001$). But unfortunately, there have been no changes in the assessment of the technical component "jumping" ($t=0,79$; $p>0,05$).

Conclusions / Discussion

The research on this topic has shown a number of scientific developments and practical measures for implementation of methods and means of choreography into the educational process in improving the technical and artistic readiness of athletes involved in rhythmic gymnastics.

The role of a rhythmic gymnastics coach is quite clear, but a choreographer's role is quite complex - to teach girls how to move beautifully, perform dance elements correctly, involve them in the culture of movements, the aesthetics of gestures, etc.

The obtained results indicate that the usage of choreographic exercises along with the basic elements of rhythmic gymnastics has made it possible to increase the results of novice 5-6 year old athletes from the experimental group in relation to the control group in performing the components: "expressiveness of body movement" ($t=4,97$; $p<0,001$), "balance" ($t=4,48$; $p<0,001$), "character" ($t=3,71$; $p<0,01$), "rhythm" ($t=4,18$; $p<0,01$) , "jumping" ($t=3,22$; $p<0,01$) and "turns" ($t=3,77$; $p<0,01$).

Thus, choreography has become an integral part of the training of novice 5-6 year old athletes and occupies not the last place in the process of training in rhythmic gymnastics. It is during these classes that the posture is formed, the musculoskeletal system is strengthened and the culture of the gymnasts' movement is formed.

Conflict of interest. The authors state that there is no conflict of interest that could be perceived as prejudicial to the impartiality of the article.

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PROBLEMS OF SELECTION OF FEMALE ATHLETES FOR THE FORMATION OF FORMATION TEAMS IN ACROBATIC ROCK 'N' ROLL

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Purpose: the substantiation of the most significant components of the comprehensive assessment of the results of the competitive program, which will determine the effectiveness of the composition of athletes for the teams of formation in the acrobatic rock 'n' roll.

Material and methods: research was conducted on the basis of clubs from the acrobatic rock and roll of the All-Ukrainian public organization "Federation of Acrobatic rock and roll of Ukraine" (FARRU). The study participated athletes of Female Command formation aged 13 to 28 years in an amount of 84 people. Qualification: 19 athletes (22,6 %) have the first discharge, 46 athletes (54.8%) have a discharge of KMS, 19 athletes (22,6 %) of the MS of Ukraine. To achieve the goal we used a complex of modern research methods: theoretical analysis and generalization of literary and Internet sources, analysis of documentary materials, pedagogical observation, anthropometry, methods of mathematical statistics.

Results: the conducted study made it possible to determine the harmonism of the structure of teams by their components and the influence of components for a comprehensive assessment for the implementation of competitive exercises.

Conclusions: as a result of the use of modern research methods managed to establish components of the contingent structure and determine the elements of the evaluation system for forming commands in the category of Female formations in the Acrobatic rock 'n' roll.

Keywords: acrobatic rock-n-roll, team of formations, selection of athletes.

Introduction

Acrobatic rock 'n' roll today is a non-Olympic kind of sport that has appeared in Ukraine since the 1990s. Of course, for such a short period of its existence, it does not yet have a scientifically sound system of long-term training of athletes, part of which is the selection of athletes and their orientation to certain specializations.

This sport belongs to the group of complex coordination sports, as it's main content is the interaction of partners, designed in motor compositions with musical accompaniment in accordance with the rules of the competition [2, 12, 21].

In fact, dance movements in combination with technically complex acrobatic elements are performed at a high pace, without pauses and static poses (except for the final pose), with a particularly characteristic color, which is determined by the characteristics of the music. At the same time, the presence of the same type of musical accompaniment in the style of " rock 'n' roll " does not impoverish this type of competition because the compositions are performed by athletes in various ways [3, 11, 16].

The category of formation of a woman in acrobatic rock 'n' roll has certain requirements for the age and number of team members and must be represented by girls from 12 years old in the number of 8 - 16 people (the final composition of the team at the All-Ukrainian competitions by age and number of team members competitions in sports Acrobatic rock 'n' roll, and in international competitions by international rules WRRC) [12, 23].

To date, competitions in acrobatic rock 'n' roll are held in the following types: solo (men, women), duets (women), couples (male + female), group performances of formation (women, couples) (male + female).

There are also categories: children, youth, juniors, adults. According to the rules of the competition, one athlete is allowed to participate in several types of categories. Therefore, athletes engaged in this sport can realize themselves in any kind of competitive categories.

With a wide choice of specializations for acrobatic rock 'n' roll classes, the coach has the task to choose for the athlete exactly the one that corresponds to individual physical development and a set of abilities for successful training.

Competitive performance in women's formations is a constant rearrangement, which must be performed with exceptional accuracy and stylistic color. During the competition program, athletes need to synchronize their movements with other team members from the foot to the gaze [19, 20].

No less important point in the performances of formation teams is the observance of a clear geometric pattern after rearrangement. For example, after placing on the field in a line, the athletes are rearranged in a circle, then diagonally, then in a wedge, then in parallel lines and other shapes [2]. The sequence of changes can be varied.

Also a prerequisite is that for the time allotted for the performance of dynamic motor activity (in the qualifying rounds 1.30-1.45 min, in the final round 2.15-2.30 min), athletes must make at least ten basic moves (mandatory basic element) and present dance figures of four types of groups. Acrobatic elements complement dance figures and expand the arsenal of motor activities of athletes, which requires a certain level of sports training [12, 23].

The calculation of points in the performances of women's teams formation is carried out according to the following criteria:

- basic step (male + female). The criterion evaluates: the quality of the technique of performing the basic element of the Basic Step, the position of the torso, the position of the hands, rhythm, synchronicity and harmony;

- dancing figures. The criterion evaluates: originality, complexity, variability, aesthetics of dance figures;

- choreography. The criterion evaluates: ideas, images, matching costumes, interpretation of music, dance lines, synchronicity, harmony, entrance to the dance floor, exit from the dance floor.

- formation notes. The criterion evaluates: clarity of choreographic drawing, rearrangement, use of space on the field, clear and uniform location of athletes on the dance floor, clarity of lines.

The competitive assessment of the team's performance among the various criteria is also influenced by the general impression of the team members, which includes compliance with height and weight characteristics, features of physical development and mastery of the technique of elements and dance figures.

The judge may also add additional points. For example, in the criterion of choreography for extraordinary artistic performance [12, 23].

Thus, for the effective existence of a formation team, all its members must meet certain aesthetic requirements and have similar genetic predispositions to reflect the combined, synchronous sports activities of acrobatic rock 'n' roll [1, 4, 14, 15, 22].

Given the fact that common to all types of competitive programs of acrobatic rock 'n' roll is group or pair interaction in the implementation of basic changes, dance figures and acrobatic elements, experts in the selection of contingents for team performances involve athletes of other specialties of acrobatic rock 'n' roll.

It is possible to give an objective description of the athlete's potential only based on certain criteria that allow to determine individual inclinations and their compliance with the motor activity of sports specialization.

In determining the selection criteria must consider: the makings that determine the anatomical and physiological features of the organism; abilities that provide speed of mastering movements and their preservation in time; giftedness, as a combination of abilities that enable success in a particular sport.

Given that all motor activities of athletes in the team must be synchronized, it is important to match the body of each athlete to perform a given set of technical elements of acrobatic rock 'n' roll and the dynamics of their performance.

Modern research in acrobatic rock 'n' roll and other complex coordination sports, in which there is an aesthetic component, indicate that to achieve high results is possible only for gifted athletes who have a rare combination of morphological

characteristics with a high level of development of leading motor skills and mental abilities that provide complexity and stability of technique.

At the present level of development of acrobatic rock 'n' roll, despite the coverage of the selection and construction of the training process of athletes in pairs for youth and adult categories, almost no attention is paid to the organization of the training process for formation teams, no criteria for selecting athletes in teams. models of a successful team are not built. As a result, the national team of Ukraine is currently not represented by participants of this type of competition in the international arena.

If we talk about the participation of women's formation teams in all-Ukrainian competitions, we can say that their number is limited, athletes of one team have a large variation of height and weight, different levels of sports training, and the composition is constantly changing. That is, coaches without any methodological materials try to solve this issue by choosing a team from the existing contingent, which takes a long time and does not give the desired results.

Therefore, determining the indicators of the structure of the contingent of athletes and their physical development, taking into account morphological characteristics as a prognostic criterion for success in selecting athletes for the formation of women's teams formation is relevant, which requires research.

Purpose of the study: substantiation of the most important components of a comprehensive assessment of the results of the competitive program, which will determine the effectiveness of the composition of athletes for team performances of formation in acrobatic rock 'n' roll.

Objectives of the study: 1. To analyze the scientific and methodological literature on the organization of training, competitive activities and selection of athletes for group performances in the category of female formations in acrobatic rock 'n' roll. 2. Identify research methods that sufficiently achieve the goal. 3. To determine the features of the structure of the contingent of women's formation teams participating in all-Ukrainian competitions in acrobatic rock 'n' roll.

Material and Methods of research

The research was conducted on the basis of acrobatic rock and roll clubs of the All-Ukrainian public organization "Federation of Acrobatic Rock and Roll of Ukraine" (FARRU). The study involved female athletes of formation teams aged 13 to 28 years. The number of subjects is 84 people. Athletes have sports qualifications: 19 athletes (22,6%) - first category, 46 athletes (54,8%) - CMS category, 19 athletes (22,6%) - MS of Ukraine.

To achieve this goal we used a set of adequate research methods: theoretical analysis and generalization of literary and Internet sources, analysis of documentary materials, pedagogical observations, anthropometry, methods of mathematical statistics

Connection of research with scientific or practical tasks, plans, programs. Scientific work was performed in accordance with the initiative scientific theme of the Department of Gymnastics, Dance Sports and Choreography: "Theoretical and methodological principles of development of system-forming components of physical culture (sports, fitness and recreation) for 2020-2025), state registration number 0120U101215".

Results of the research

The presented material was collected during the research in the field of training women's formation teams in acrobatic rock 'n' roll.

In analyzing the scientific and methodological literature, we paid special attention to the methods of selection of athletes in other complex coordination sports, which have a component of joint group activities and a combination of biokinematic characteristics of sports techniques with the rhythmic structure of musical accompaniment.

The authors [5, 6, 9, 10] propose to select team members for joint activities taking into account certain features of physical development, physical and functional fitness of athletes, among which are necessarily present: anthropometric parameters, propensity to develop leading physical qualities and ability of athletes to perform motor activity in a conditioned environment.

According to the works of the authors [7, 8, 13, 17, 18], the adaptability to perform a certain motor activity is inherent in a person from birth and is reflected in his physical development. Indicators of physical development include a complex indicator of morpho-functional parameters of the organism, which is an indicator of its proportionality of development and stock of physical capabilities.

To solve the problems we made measurements of height and weight characteristics, determined the IR, which gives an understanding of the ratio of fat to other components of body composition. Also indicative of the selection of athletes for team performances is the age, experience in the chosen sport, and the age at which the athlete has reached a high qualification. These characteristics can then be used to create a passport of the relevant specialization of athletes in acrobatic rock 'n' roll.

Since school and adult athletes can take part in team performances, we analyzed and compared the indicators of these age ranges.

Table 1 presents the results of statistical processing of the teams formed in the course of acrobatic rock 'n' roll collected during the control of passport data of athletes.

Table 1

Indicators of physical development and the level of quality for the contingent of female athletes of the FARRU formation teams (n = 84)

Indexes	Body length, sm	Weight, kg	IK, kg/m^2	Experience classes, years	Passport age, years
Contingent of 1 group aged 13-16 years (n=46)					
$\overline{X}$	162*	50,6*	19,1*	7,5*	14,5*
S	0,07	7,14	1,81	2,08	1,14
m	0,01	1,05	0,27	0,31	0,17
max	175	63,2	23,4	11	16
min	145	33	15,2	3	13
Contingent of 1 group aged 17-28 years (n=38)					
$\overline{X}$	166	56,2	20,4	9,5	20,5
S	0,05	5,33	1,9	3,13	3,08
m	0,01	0,86	0,31	0,51	0,50
max	178	70	25,7	15	28
min	156	43	16,8	3,5	17

Remark: * asterisks indicate significant changes between group indicators

The obtained results give an idea of the studied contingent of athletes engaged in acrobatic rock 'n' roll specializing in women's formations, representing clubs that are part of different branches of FARRU and can serve as a criterion for the selection of athletes in teams.

Analyzing the contingent of teams of women's formations, we can say that there are 46 school-age athletes and 8 fewer adult athletes. This composition can be represented in the ratio 55: 45.

The average age of school-age athletes is: 14,5±1,14 years. The maximum age is 16 years and the minimum is 13 years. In adult athletes, this figure is 20,5±3,08 years. The maximum age is 28 years and the minimum is 17 years.

The average height of school-age athletes is 162±0,07 cm. The maximum height is 175 cm and the minimum is 145 cm. For adult athletes, this figure is 166±0,05 cm. The maximum height is 178 cm and the minimum is 156 cm. .

The average body weight of school-age athletes is 50,6±7,14 kg. The maximum limit is 63.2 kg body weight and the minimum 33 kg. In adult athletes, this figure is 56,2±5,33 kg. The maximum limit is a body weight of 70 kg and a minimum of 43 kg.

Analyzing the data of the length of service, we can say that both adults and school-age athletes have a minimum length of service of 3 years. The maximum number of years of acrobatic rock 'n' roll training for school-age athletes is 11 years, and for adult athletes 4 years more. The average length of service for school-age athletes is 7,5 ± 2,08 years, and for adult athletes this figure is 9,5±3,13 years.

The obtained data emphasize the data of other authors in the field of training athletes [6, 7, 10, 13, 15, 16, 17, 21] and indicate that sports can be started at any childhood or adolescence. However, all the authors agree that to solve certain pedagogical tasks, the beginning of classes must coincide with the primary school age, when the future athlete lays the foundation of physical and functional fitness. And the qualitatively carried out selection and orientation of the sportsman to occupations by a certain specialization at each stage of long-term preparation will considerably reduce a way to success.

The average result of the growth-weight index of Kettle in school-age athletes is 19,1±1,81 kg / m^2. The maximum limit is the result of 23,3 kg / m^2, and the minimum is 15,2 kg / m^2. In adult athletes, the Kettle index is 20,4±1,9 kg / m^2. The maximum limit is the result of 25,7 kg / m^2, and the minimum is 16,8 kg / m^2.

When comparing the average values for the reliability of the differences (Table 1), we found that all the studied indicators have significant differences at $p < 0.05$. Thus, according to age, training experience and height-weight characteristics, both groups of athletes have a large variation.

For each coach when planning process, it is indicative to obtain individual indicators of athletes.

The distribution of individual indicators of female athletes by IR in accordance with the norms given by the WHO is presented in Fig. 1.

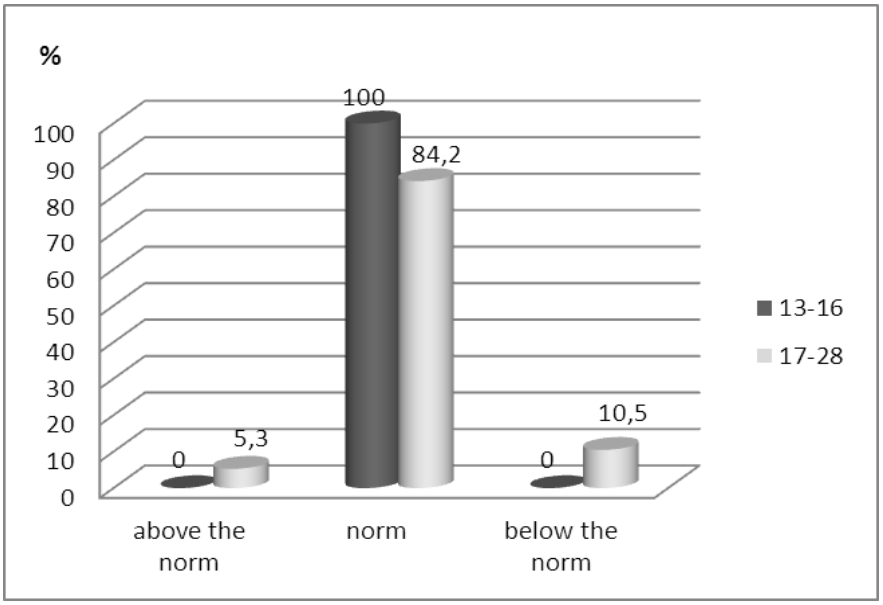

Fig. 1. Distribution of individual indicators of athletes by IK 13-16 n = 46, 17-28 n = 38

Of the total number of surveyed athletes aged 13-16 for IK 100% of the results are within normal limits. A slightly different distribution of IK relative to the norms is observed among athletes aged 17-28. In this contingent, the results of 32 athletes (84,2 %) correspond to the norm, 2 athletes (5,3 %) also have results above the norm and 4 athletes (10,5 %) have below the norm, but these results are close to the norm.

Thus, in the vast majority of results of athletes on IR correspond to the norm, which indicates the positive impact of acrobatic rock 'n' roll on the metabolic processes of the surveyed contingent.

It is noteworthy that a characteristic feature of the structure of the teams is a wide passport age range of their members.

Graphic representation of the distribution of the age range of the studied athletes are presented in the graph (Fig. 2).

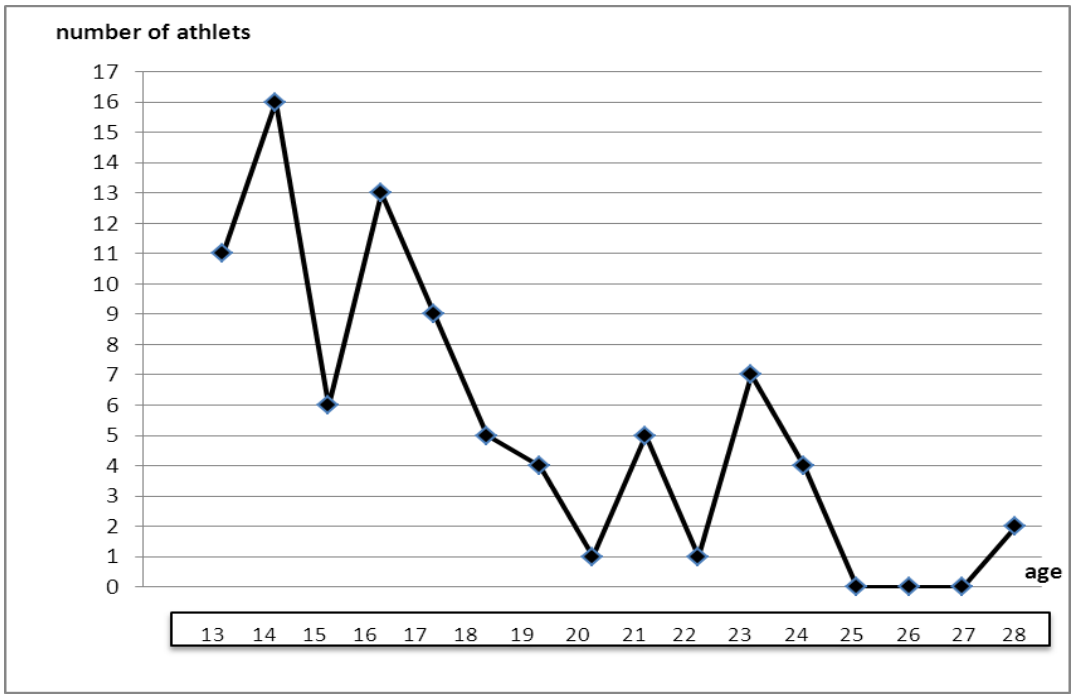

Fig. 2. Distribution of the age range of female athletes of formation teams in acrobatic rock 'n' roll (n = 84)

According to the data presented in Figure 2, among the surveyed contingent there are eleven athletes aged 13 years (13,1 %). Also in the sample of the studied athletes is traced one person aged 20 and 22, which is 1,2 %. Two athletes are 28 years old (2,4%), they can be called veterans of acrobatic rock 'n' roll, but female formies are a category in which more adult girls can realize themselves than in paired performances, and today athletes of this type age were selected as coaches for team performances.

Explaining this issue more broadly, it can be added that in paired performances, adult athletes, participating in competitions, must perform flight

acrobatic elements. In the category of women's uniforms, not all team members must perform such acrobatic elements at the same time. Due to the fact that the team of adult athletes consists of up to 16 people, some of them perform the function of support, some - the function of those who push and those who ensure the safety of the athlete during landing, after performing flight elements, and some perform flight acrobatic elements. So this type of competition allows adult sportswomen to continue their sports careers, who for various reasons are not able to compete in doubles, but this decision can be called temporary, because it does not solve the problem of selecting the most promising athletes in the team.

There are 4 athletes aged 19 and 24, which is 4,8% of the total age range of athletes. Five athletes each have the presence of girls aged 18 and 21 (5,9 %) among the surveyed contingent. Six athletes (7,1 %) are 15 years old, seven (8,3 %) have reached 23 years. There are 9 seventeen-year-old athletes (10,7 %). The presence of athletes who have reached 16 years of age is 13 people (15,5 %). The largest number of 16 people is among girls aged 14 (19 %). There are currently no athletes aged 25, 26 and 27 among the surveyed contingent.

The analysis revealed that all athletes meet the requirements of the competition rules by age, but the wide range does not allow to determine the most optimal age for selection and requires the study of additional indicators.

In team performances there can be nothing more or less important for one of the team members, because the score for the performance is given to the whole team, but it depends on the skill of each athlete [5, 6, 9, 11].

Of course, the success of performances at competitions is due to the presence in the team of highly qualified athletes who have extensive competitive experience and can consistently perform complex elements of acrobatic rock 'n' roll. To identify the possibility of approval of motor activity of such an age range of female athletes, we paid attention to such a characteristic as the level of qualification of the studied athletes, which can be considered one of the criteria for selecting the contingent in the team.

The consistency of the contingent of formation teams with the level of their professional qualification is presented in Fig. 3.

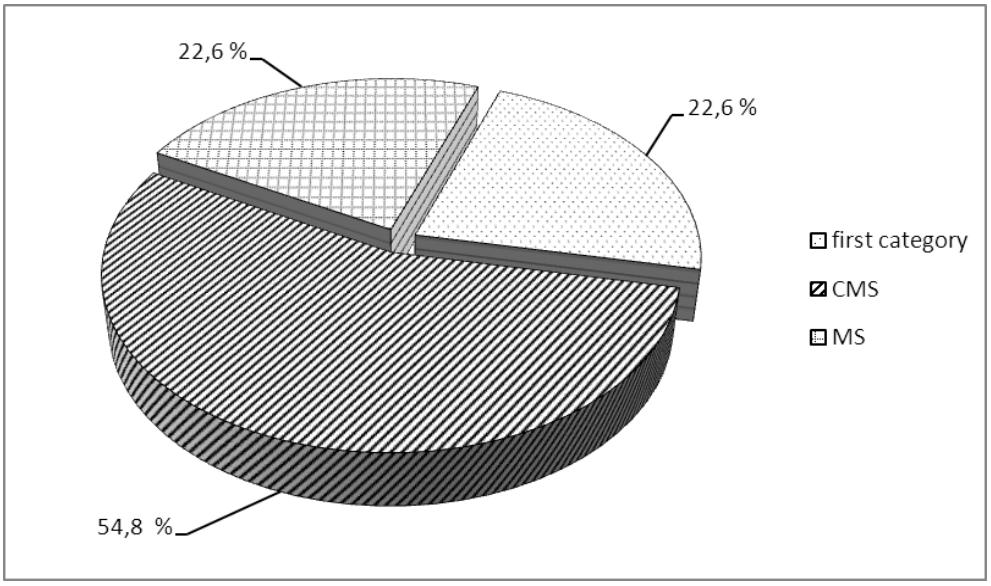

Fig. 3. Consistency of the contingent of teams with the level of their professional qualifications (n = 84)

The data of the analysis indicate that 19 athletes (22,6 %) have the first category, 46 athletes (54,8 %) performed the category of CMS, and the title of Master of Sports of Ukraine is found among the surveyed contingent of 19 athletes (22,6 %).

To date, the level of sports qualification of athletes received by participating in competitions in doubles, solo and participating in competitions of junior doubles and girls formations.

The fact of the presence in the maximum number of athletes of mass categories is confirmed by other studies in sports [4, 6, 7, 9, 12], which convincingly show that not every athlete is able to get high qualification in the chosen sport, but only those who have the necessary set genetically determined components that allow for purposeful pedagogical influence to express themselves in a particular type of professional or sports activity.

Such information gives an understanding that athletes who have previously been engaged in acrobatic rock 'n' roll and have experience in performing motor activities in this sport can be considered for selection into women's formation teams.

And in combination with other indicators, these data can be used as a model characteristic.

We also conducted an analysis of the age at which athletes achieved high qualifications. The results are presented in Fig. 4.

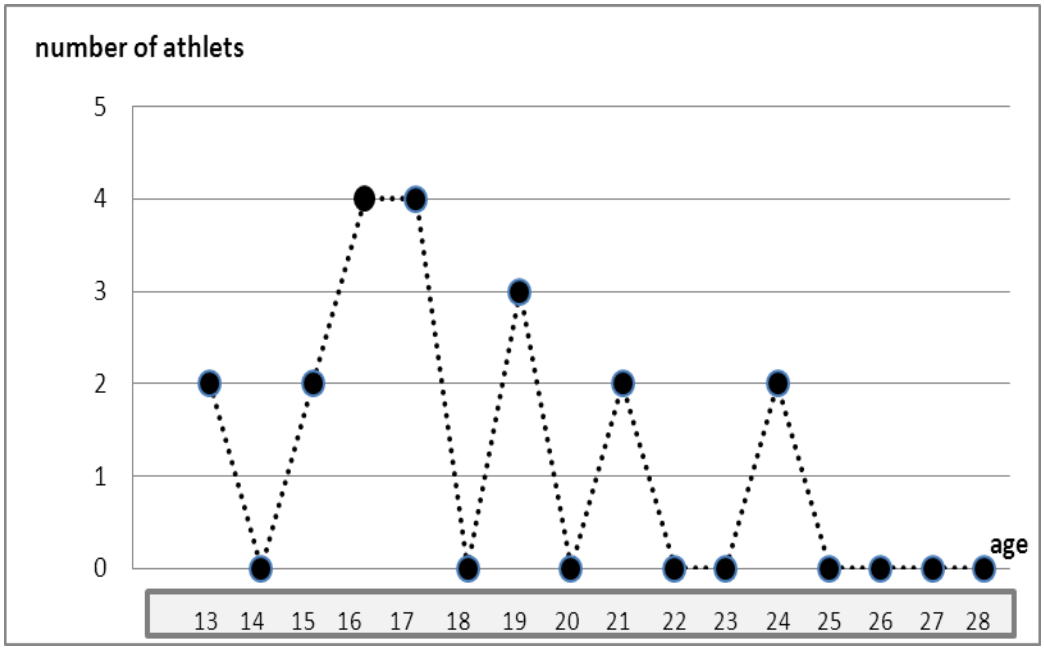

Fig. 4. Age at which athletes reached high qualification (n = 19)

The analysis showed that the maximum number of highly qualified athletes is among girls aged 16 and 17 for 4 people, which is 21,1% of the total number of options. Three 19-year-old athletes (15,8%) have the title of master of sports. There are two masters of sports of Ukraine among athletes aged 13, 15, 21 and 24 (10,5 % each).

Among the surveyed contingent there were no athletes with the title of MSIK.

Analysis and comparison of the results shown in Figure 2 and Figure 3 allows us to conclude that athletes 20, 22, 23, 25-28 years, neither in number nor in skill level can not be used as models of success and participate in the selection of athletes for formation teams.

In the future, we made a correlation analysis of the studied indicators, which gives an understanding of the interdependence of the studied indicators in the contingent of athletes, and the data are presented in table 2.

Table 2

Correlation analysis of the studied indicators of athletes

Indexes	1	2	3	4	5	6
1	1					
2	0,26	1				
3	-0,33	-0,06	1			
4	0,15	0,38	0,09	1		
5	0,07	**0,50**	0,14	**0,70**	1	
6	-0,01	0,37	0,13	0,16	**0,82**	1

Remark: 1 – experience; 2 – age; 3 – qualification; 4 – height; 5 – body weight; 6- IK.

The correlation analysis revealed a weak relationship between age, experience and qualifications of athletes, which confirms the lack of a sound selection system for many years of training and orientation of athletes to specialization in acrobatic rock 'n' roll. Weak dependence is observed in the following indicators: between seniority and age (r=0,26) weak positive dependence; between qualification and length of service (r=-0,33) weak negative relationship.

Indicators of physical development correlate with each other in the following relationship: between height and age (r=0,38) weak positive relationship; between age and IK (r=0,37) weak positive relationship; between body weight and age r=0,50) average positive relationship; between body weight and height (r=0,70) average positive relationship; between body weight and IK (r=0,82) high positive relationship. Therefore, physical development indicators must be taken into account when selecting athletes. Other indicators have a very low relationship (r<0,20).

The analysis revealed that the contingent of teams has a very large variation of structural characteristics, and experts in acrobatic rock 'n' roll do not use selection techniques. This fact confirms the low development of the studied problem.

Today, FARRU clubs have a sufficient number of contingents to form formation teams. The federation is constantly holding competitions to promote and develop this sport and is looking for ways to address the issues of creating women's formation teams and their representation on the world stage. Coaches also try to

address this issue by forming teams from the available contingent. However, some athletes who have succeeded in doubles have already exhausted their reserves and their inclusion in women's teams does not give the desired result.

To build effective team training, it is necessary to review the entire training process and define criteria for selecting the appropriate contingent for joint team activities.

For successful training of teams it is necessary to have a passport of the environment which includes: the availability of exercises and their complexity, the rank of achievements of athletes, a list of arsenal of exercises available to stay in the appropriate rank, the required level of physical, mental and trophic qualities. acrobatic rock 'n' roll and control methods. Theoretical substantiation of construction of the passport of professional activity is carried out in characteristic semantic spaces with introduction in them of uniform measurement of sigma distance of Gaussian distribution of density of elements of comparison. This construction is performed in the Cartesian coordinate system, where the coordinate axes act as: "requirements of professional activity" and "individual capabilities of the athlete." Further geometric analysis of the construction of characteristic semantic spaces allows to establish the ranking qualification of the capabilities of the surveyed contingent. The structure of this process is given in Fig. 5.

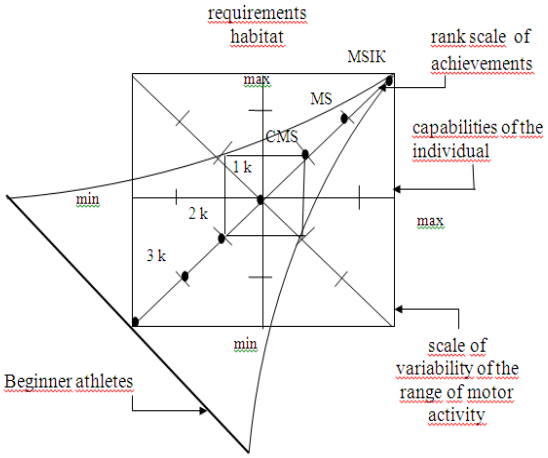

Fig. 5. Characteristic semantic space of construction of the corresponding passport of specialization of formation in acrobatic rock and roll

Carrying out further research and creating an athlete's passport for joint group activities will provide an opportunity to create a high-quality competitive composition of formation teams.

Conclusions / Discussion

1. The analysis of literary and Internet sources made it possible to find out the unresolved issues of organizing the training process of athletes for group performances in the category of female formations in acrobatic rock 'n' roll and the lack of selection methods for forming athletes into a team.

2. Analysis of sources of information allowed to form research methods that sufficiently allow to achieve this goal.

3. The obtained results made it possible to determine a large variation in the structure of the contingent of athletes of the formation teams of the Federation of Acrobatic Rock 'n' Roll and to determine the need to create a passport of specialization. Creating a passport of specialization will fundamentally change the system of educational and training process of athletes specializing in group performances and determine the selection criteria for the formation of teams in the category of female formations in acrobatic rock 'n' roll.

Prospects for further research. Further development of this problem will be associated with the certification of athletes specializing in group performances of women's formation teams in acrobatic rock 'n' roll to select the optimal training mode and assess their progress to reflect the degree of readiness to perform the task of complexity.

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INVESTIGATION OF THE EFFECTIVENESS OF USING ADDITIONAL EQUIPMENT IN THE PREPARATORY PERIOD OF THE ANNUAL MACROCYCLE OF HIGHLY QUALIFIED POWERLIFTERS

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Purpose: to investigate the influence of the use of additional equipment, namely, rubber bands, on the development of power indicators of highly qualified powerlifters.

Material and methods: 20 highly qualified powerlifters were involved in the study.

Results: found that the use of additional equipment in powerlifting contributes to a more effective development of athletes' strength qualities, and therefore, leads to an increase in sports results in squatting, bench press and deadlift. The use of additional equipment makes it possible to perform exercises using rubber bands. Rubber bands are fixed in the power frame from above, after which they are stretched and attached to the bar, due to the stretching of the bands, the athlete has the opportunity to facilitate lifting at the lowest point. The help of the expander at the bottom point is the greatest, and at the top point is absent. These exercises are

recommended for highly qualified athletes, when using them, it is necessary to closely monitor the technique of performing the exercises, since in the last phases of the exercises muscle fatigue is observed and the technique of performing the exercise is often violated. The sportsmen of the experimental group used exercises with a rubber expander in the preparatory period for the development of strength qualities in competitive exercises: squats with a barbell, bench press, deadlift. During the training period, we performed 768 barbell lifts in squats, equal to 169,000 kilograms, 1020 lifts in the bench press, equal to 141 thousand kilograms, 720 lifts in deadlift, equal to 165,000 kilograms. During the study period, the control and experimental groups increased their indicators: in squatting with a barbell (control - 10 kg, experimental - 15 kg; $t=2,82$; $p<0,05$); bench press (respectively - 5 kg, 10 kg; $t=1,81$; $p>0,05$) deadlift (respectively - 5 kg, 15 kg $t=1,63$ $p>0,05$), which gives a more significant increase the result of the experimental group on the control.

Conclusions: it was found that the use of this method contributes to a more effective development of power indicators, and therefore leads to an increase in sports results in all three disciplines of powerlifting.

Keywords: powerlifting, additional equipment, squats, rubber expander.

Introduction

The modern training system requires constant improvement of methods to improve the strength indicators of athletes in strength sports. As the analysis of special literature shows, in the strength training of powerlifters, methodical approaches and techniques, tested in weightlifting, are mainly used [2, 3]. In annual macrocycles at all stages of the training of powerlifters, static, dynamic and mixed modes of work are used, since these modes are classic for the training of athletes of strength sports. [7].

Currently, the technical support makes it possible to successfully apply non-traditional methods of developing strength qualities, one of which is the use of additional equipment in the form of rubber expander. This option for using additional equipment is relevant for study in the training of powerlifters, since all classical

exercises have a fixed load with which the athlete interacts, and with the help of modern training means, namely rubber expander, we can change the force with which the projectile interacts with the athlete , where the effort that the athlete applies will change, but the weight will remain the same due to the use of resistance bands. Thus, the load with which the athlete interacts will change.

Analysis of scientific and methodological literature shows that the research of well-known domestic scientists: V. Oleshko [6], O. B. Piven [7] - concerned the speed-strength training of weightlifters, L. Dvorkin [2] investigated the development of strength abilities in an isokinetic mode using training devices. All practical experience indicates a lack of research on unconventional methods of developing strength abilities, especially with the use of variable loads in powerlifting. This mode is promising for study, which determined the relevance of the selected research topic.

Famous researchers in the field of powerlifting and strength sports, V. Oleshko [6], A.I. Stetsenko [8] found that highly qualified powerlifters have a high intensity, about 80 – 100 % of the maximum, and a fairly high training volume, equal to 80-100 barbell lifts per week in basic exercises, through which an increase in strength indicators by increasing the volume or intensity is not effective. Also, the fulfillment of such requirements does not lead to an increase in strength indicators and is dangerous from the side of traumatism and psychological and physical fatigue of an athlete, therefore, the search for new methods and modes is important and relevant.

The result of the analysis of modern literature is the absence and insufficiency of research on unconventional methods for the development of strength abilities, especially the development method using rubber expander in powerlifting. This mode is promising for study, which determined the relevance of the selected research topic.

Purpose of the study– is to investigate the influence of the use of additional equipment, namely, rubber resistance bands, on the development of power indicators of highly qualified powerlifters.

Material and Methods of research

Research methods: according to the methodological approach in solving the problem and the set tasks, the research program included a set of research methods:

analysis of scientific and methodological literature, determination of special physical preparedness using pedagogical testing of qualified powerlifters, pedagogical research and methods of mathematical statistics.

Organization of the study: this study involved highly qualified powerlifters, athletes from the Youth Sports School "KhTZ" and athletes who train on the basis of the KhNUS. The experiment involved 20 highly qualified powerlifters of different ages. All of them were qualified as MS or MSIG. The participants were divided into two equal groups - control and experimental, 10 people each. All athletes compete in weight categories up to 93 and up to 105 kilograms. The training was carried out 4 times a week at the training base of the Youth Sports School KhTZ and KhNUS. Experiment duration 6 months.

Results of the research

The experiment was organized according to the traditional training program for powerlifters for the control group, the experimental group trained using rubber bands.

Before the experiment, all participants took part in control competitions (their results were accepted by us as the initial level of preparedness). The training period was 6 months.

The control group trained according to the generally accepted method, the volume of the load is indicated in Table 1. In the experimental group, the total amount of work was insignificantly, but reduced due to the greater intensity of exercises using rubber expander to create a variable load, the amount of load is indicated in Table 1.

The difference in the training program of the experimental group was in the use of additional equipment, namely, rubber bands to create a variable load. The implementation of these exercises is realized with the help of rubber bands, which are fixed in the power frame from above, stretched and attached to the barbell due to the stretching of the rubber bands, the athlete has the opportunity to facilitate lifting at the bottom point. That is, the help of the expander at the bottom point will be the greatest, and at the top, it will be almost absent. Therefore, the result of using this equipment is the ability to work with a large weight in the range of 90 – 110 % of the

one-time maximum, in contrast to the classical modes, in which the main work is carried out in the range of 70 – 90 % of the one-time maximum.

Table 1

Volume of the load of the control and experimental groups for the period of the experiment

Exercises	CG		EG					
	NLB, repetition	Tonnage, thousand kilograms	NLB, exercises without rubber bands, repetition	NLB, using rubber bands, repetition	NLB general, repetition	Exercise tonnage without rubber bands, thousand kilograms	Tonnage using rubber expander, thousand kilograms	Tonnage general, repetition
Squats with a barbell on shoulders	780	166	494	274	768	98	71	169
Bench press	1050	140	752	268	1020	85	62	147
Deadlift	740	162	436	284	720	95	70	165

Exercises using resistance bands were used with subsequent regularity: in squats and bench press every week, deadlift - once every two weeks (due to the specific dosage of the training volume and intensity in the deadlift). Exercises with a rubber expander were used for 4 attempts with the number of repetitions per attempt in the range from 4 to 1.

The main effects of using additional equipment, namely rubber bands, in addition to those commonly known from strength training, are high overall intensity. The effect of working with a large weight is also important, it strengthens the athlete's confidence when performing exercises with maximum load.

At the end of the general preparatory stage, the athletes of the experimental group showed higher results, in contrast to the control group, which was trained according to the generally accepted method. Thus, at the beginning of the experiment, the differences are insignificant: in squats with a barbell (control – 237,5 kg, experimental - 235 kg; $t=2,81$; $p<0,05$) in the bench press (respectively - 165 kg,

162.5 kg t=1,84; p<0,05) standing thrust (respectively - 255 kg, 252.5 kg t=1,12; p<0,05) (Table 2), (Table 3).

Table 2

Indicators of the results of competitive exercises of the control group at the beginning of the preparatory period and at the end (n_1= n_2=10)

Indicators	At the beginning		At the end		*t*	*P*
	$\overline{X}_1 \pm m_1$	*V* ,%	$\overline{X}_1 \pm m_1$	*V* ,%		
Squats with a barbell on shoulders	237,5 ± 2,5	1,1	247,5 ± 2,5	1,0	2,81	<0,05
Bench press	165,0 ± 2,5	1,5	170,0 ± 1,25	0,7	1,84	>0,05
Deadlift	255,0 ± 3,75	1,5	260,0 ± 2,5	1,0	1,12	>0,05

The coefficients of variation of all the main indicators of basic exercises separately for the control and experimental groups did not practically exceed the overall output level. For example, for squats with a barbell in the control group, it was V=1,1%, for the experimental group - V=1,6%. Accordingly, for the control and experimental groups, the coefficients of variation were the following values: bench press V=1,5%, =1,9%; deadlift - V=1,5%, V=1,5.

Table 3

Indicators of the results of the competitive exercises of the experimental group at the beginning of the preparatory period and at the end (n_1= n_2=10)

Indicators	At the beginning		At the end		*t*	*P*
	$\overline{X}_1 \pm m_1$	*V* ,%	$\overline{X}_1 \pm m_1$	*V* ,%		
Squats with a barbell on shoulders	235,0 ± 3,75	1,6	250,0 ± 3,75	1,5	2,81	<0,05
Bench press	162,5 ± 3,13	1,9	172,5 ± 2,5	1,5	2,52	<0,05
Deadlift	252,5 ± 3,75	1,5	267,5 ± 4,4	1,6	2,61	<0,05

At the end of the experiment, the average indicators in squatting with a barbell were (control – 247,5 kg, experimental - 250 kg; t=0,55; p<0,05) bench press (respectively - 170 kg, 172,5 kg t=0,89; p<0,05) deadlift (respectively - 260 kg, 267,5 kg t=1,48; p<0,05) (Table 4).

Table 4

Indicators of the results of competitive exercises in the experimental group and the control group at the end of the preparatory period (n_1= n_2=10)

Indicators	**CG**		**EG**		***t***	***P***
	$\overline{X}_1 \pm m_1$	*V* ,%	$\overline{X}_2 \pm m_2$	*V* ,%		
Squats with a barbell on shoulders	247,5±2,5	1,0	250±3,75	1,5	0,55	>0,05
Bench press	170,0±1,25	0,7	172,5±2,5	1,5	0,89	>0,05
Deadlift	260,0±2,5	1,0	267,5±4,4	1,6	1,48	>0,05

At the end of the experiment, the difference between the indicators was also probable: in squats with a barbell (control - 10 kg, experimental - 15 kg; t=2,82; p<0,05); bench press (respectively - 5 kg, 10 kg; t=1,81; p>0,05) deadlift (respectively - 5 kg, 15 kg t=1,63; p>0,05) (Table 5).

Table 5

Increase in competitive exercises of the control group and the experimental group at the end of the preparatory period (n_1= n_2=10)

Indicators	CG		EG		*t*	*P*
	$\overline{X}_1 \pm m_1$	V,%	$\overline{X}_2 \pm m_2$	V,%		
Squats with a barbell on shoulders	10,0±1,25	12,5	15,0±1,25	8,3	2,82	<0,05
Bench press	5,0±1,25	25,0	10,0±2,5	25,0	1,81	>0,05
Deadlift	5,0±3,75	75,0	15,0±5,0	33,3	1,63	>0,05

Conclusions / Discussion

The analysis of scientific literature has confirmed that in recent years, scientists have conducted research on the content and methodology of the training process of qualified powerlifters by different methods (Oleshko V.G., Stetsenko A.I.) [6, 8]. However, the impact of the use of rubber bands in the training of qualified powerlifters in the preparatory period has been little studied, which prompted an analysis in this direction.

The results of a pedagogical experiment with the use of rubber bands in the development of power qualities of qualified powerlifters show that the use of this method contributes to a more effective development of power qualities, and, therefore, leads to an increase in sports results in all three disciplines of powerlifting. The use of exercises with rubber bands is recommended for only highly qualified athletes, because when using it, it is necessary to closely monitor the technique of performing the exercises in which this method is used, because in the last phases of the exercises, muscle fatigue is observed and the technique of performing the exercise is often violated.

During the study, the control and experimental groups increased the indicators: in squatting with a barbell (control - 10 kg, experimental - 15 kg; t=2,82; p<0,05); bench press (respectively - 5 kg, 10 kg; t=1,81; p>0,05) deadlift (respectively - 5 kg,

15 kg t=1,63; p>0,05), which gives a more significant increase in the result of the experimental group on the control.

The study has confirmed the feasibility of using additional equipment, namely, rubber expander, and its further study.

Prospects for further research. Further research will be aimed at developing and substantiating the training process of qualified powerlifters at the stage of the preparatory period of the annual macrocycle.

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